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- After Hours: Educational Software for The Students In Your House
- Remote-Control Software: 11 Ways to Stay in Touch

PC MAGAZINE

WWW.PCMAG.COM THE INDEPENDENT GUIDE TO PERSONAL COMPUTING VOL. 17 NO. 15 SEPTEMBER 1, 1998

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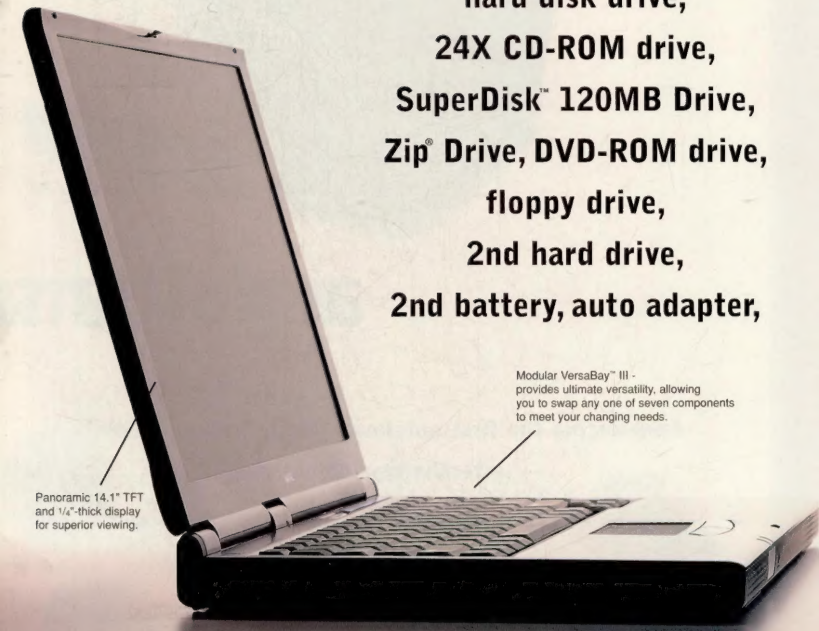

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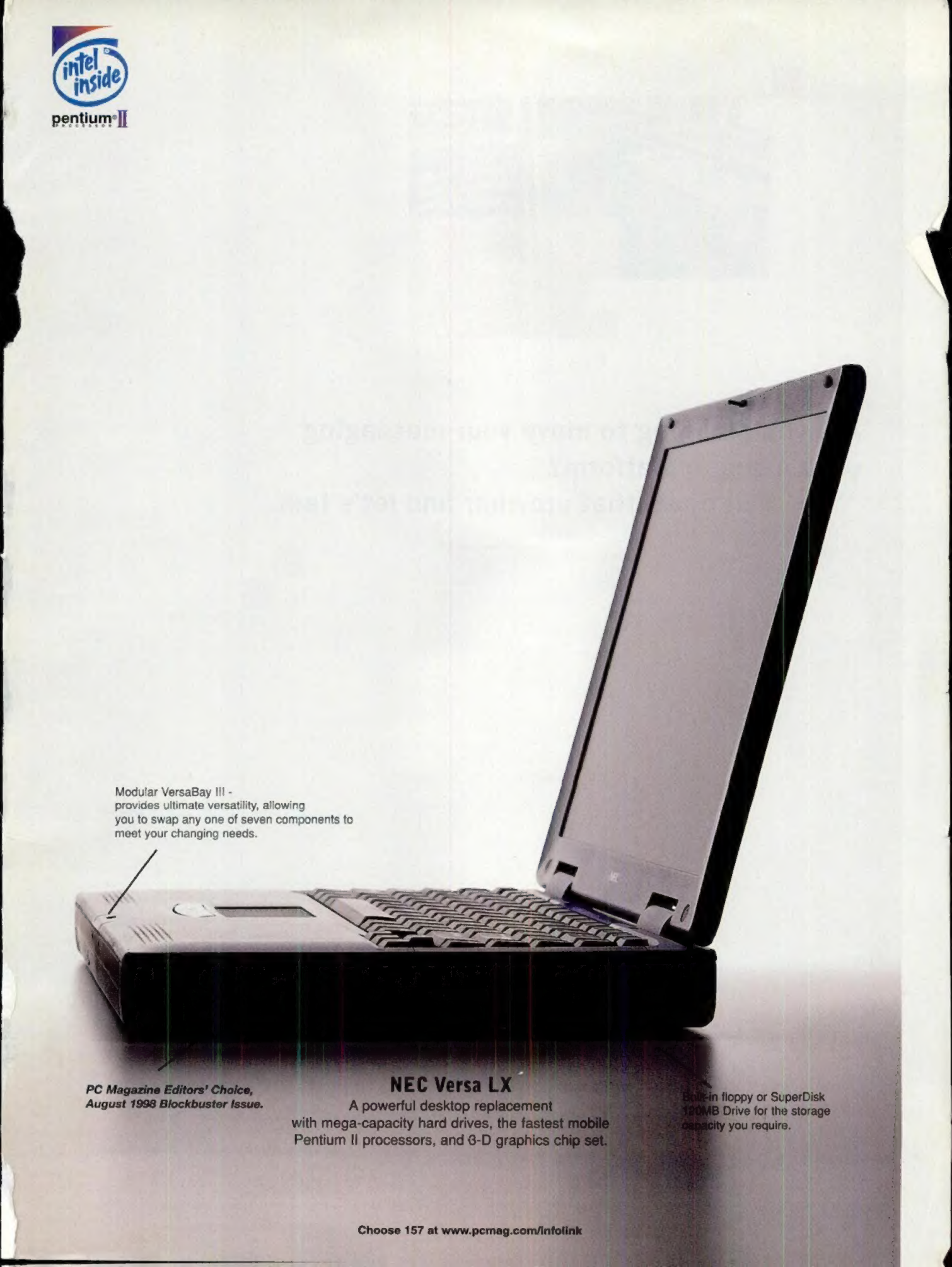
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Unify.

There are a lot of solid arguments for putting everyone and everything onto one messaging platform. A company can't communicate when its e-mail systems spew gibberish at each other. A lot of older systems only know how to send e-mail. It's tough to manage umpteen different systems and directories. And the sheer volume of messages can slow e-mail to a drawl. Unifying your messaging platforms can solve these problems.

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It's Time to Act on Y2K

By now, you've undoubtedly heard a lot about the so-called "year-2000 problem," or Y2K, as many folks have taken to calling it. From many of the articles and news reports, you have probably deduced that this is a serious problem—one that could mean that thousands of computers across the world will not work properly, posing an enormous threat to businesses, governments, and the economy in general.

Many people who have looked closely at the problem have become alarmists, predicting imminent doom between now and then. I know friends and associates who are making plans for food in case of a coming collapse of the power grid. I believe that most of the horror stories you're hearing will be averted, but we can avoid a real disaster only if we all do what we can to fix as many year-2000 problems as possible between now and then.

The most important thing you can do is make sure your business or organization is as prepared for the year 2000 as it can be. This problem is much more complex than it appears. I'll list concerns in order of priority.

The biggest burden is on critical infrastructure systems. I'm talking about systems that can't be down for even a day without a serious problem—whether we're talking about power systems, transportation, or other critical safety systems. In most cases, these rely on complex custom code for mainframes and/or lots of embedded systems in which it's hard to know all the dependencies. After all, you may have your firm's systems corrected but find that a critical supplier still has a problem. Work on identifying and correcting potential Y2K problems in such systems should have already begun. If you work with such a system, you should investigate now to make sure that the problem is under control.

The next concern is server-based applications, the kinds that are shared by multiple people and often end up running companies. Such systems range from off-the-shelf accounting, order-fulfillment, and messaging applications to custom applications designed specifically for your business. These applications cannot be fixed overnight, so you need to make sure your organization is taking steps to fix the problems as soon as possible.

Finally, we come to desktop machines. For yourself or for a small organization, taking the first few steps is not difficult.

You can easily check whether the BIOS on an individual machine can handle the year 2000. Many vendors offer little utilities that check for the problem, and we've posted one on our Web site at *www.pcmag.com/y2k*. If your machine is new you probably don't have a problem, but it's better to be safe than sorry. We have heard some reports of relatively recent PCs with noncompliant BIOSes. If your PC's BIOS is not compliant, see our Web site for some fixes.

Similarly, checking your applications isn't hard. Most major vendors already have posted lists of which applications have Y2K problems and which don't. (To make it easier, we've collected these links as well as links to other Y2K resources at our site.)

The challenge is much harder if you're running custom software. Then you must check your own code (if you wrote it) or get the vendor to warrant the software. In particular, you should check databases, spreadsheets, and various macros that use date math, especially if they pull data in from other systems.

This only becomes more difficult in a large organization, because it has to figure out how to roll out the correct changes to BIOSes, applications, and communications software to lots of machines. That's the kind of scenario that gives nightmares to IT professionals.

Again, I think the worst of the problems can and will be averted, but not everything will be fixed in time. I particularly worry about embedded systems, enormously complex government systems, and systems in countries without much technology infrastructure. I'm much more optimistic about the machines most of us use in business—but only if we all work together to solve the Y2K problem.

MICHAEL J. MILLER

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New Micron MicroTower Featured

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WEB PORTALS

HOME ON THE WEB

BY DAVID LIDSKY

It's all about having a comfort level, a place that's familiar and predictable, a sense of community. A place to call home. That's something we like in our computers, too. The online services that traditionally served in this role tried to be everything to users. More and more, people want an online home base to be a starting point from which they jump onto the wild and woolly Web. With a number of Web sites vying for this coveted role, we take a look at what 11 of them actually deliver **100**

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REMOTE-CONTROL SOFTWARE

Eight Ways to Stay In Touch

BY STEVE RIGNEY

Remote-control software has long since broken out of its origins as a way for one person to stay connected to a work PC after hours. Now, in addition to these so-called day extenders, you can add corporate help desk operators, system administrators, and PC customer service reps as devotees of remote-control technology. Our far-flung work situations require it, and remote control delivers 178

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OVER THE EDGE?

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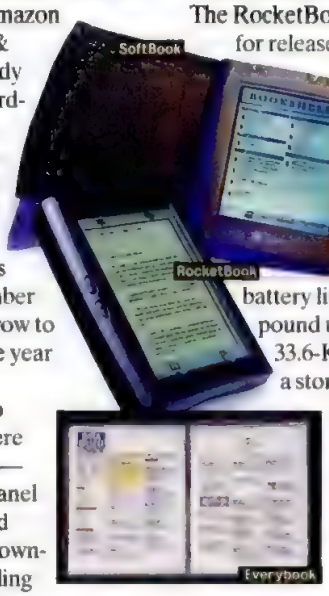
Pipeline

Palm Readers

The Web could be the best thing to happen to books since the advent of papyrus. But if you already buy books on the Web from Amazon.com or Barnes & Noble, you already know that. According to estimates, 31 million adults have Web access at home, and 1.9 million of them are buying books online. That number is projected to grow to 9.5 million by the year 2000.



So let's turn to chapter two, where electronic books—hand-held flat-panel displays designed specifically for downloading and reading books from the Web—make their appearance. NuvoMedia, backed by media giant Bertelsmann has developed the 1.4-pound RocketBook. About the size of a paperback book, the RocketBook has a claimed battery life of 20 hours and a storage capacity of 4,000 pages, or about ten novels. It connects to a PC via a serial port so you can download books (encrypted so that they're readable only on a RocketBook) from the company's Web site. NuvoMedia has partnered with Barnes & Noble to sell digital editions of books. The RocketBook is scheduled for release in the fourth quarter for about $500.

In September, SoftBook Press plans to debut its $299 SoftBook. It has a claimed battery life of 5 hours, a 2.9-pound unit with a built-in 33.6-Kbps modem, and a storage capacity of 100,000 pages. To download books from SoftBook Press (encrypted and copy-protected), you plug the unit directly into a phone jack and connect to the SoftBook Network.

To be more like a real book, the Everybook Dedicated Reader, from Everybook, has twin screens to display pages side by side. The internal modem downloads books directly from the Everybook Store to a 540MB PC Card. Priced at $1,600, the Everybook weighs under 4 pounds, has a 4- to 6-hour claimed battery life, and should be available in January.

A Handbook for Web Success

What do American Airlines, Babson College, Bell Atlantic, Boeing, Cisco Systems, Dell Computer, Dow Jones, General Motors, Hertz, iPrint, the National Science Foundation, National Semiconductor, PhotoDisc, Tripod, and Wells Fargo have in common? They all have wildly successful Web presences, according to industry pundit Patricia Seybold, who spent the past two and a half years analyzing their Web strategies.

In *Customers.com*, available this fall from Times Books, Seybold presents a case study of each company and boils everything down to eight success factors. These range from identifying the customer you're going after (as American Airlines did by targeting frequent fliers) to delivering personalized service (as General Motors did with its OnStar global positioning system, which locates your car when you call for assistance).

PHOTOGRAPHY BY THOM O'CONNOR (SOFTBOOK), JOHN RUDY PHOTOGRAPHY (EVERYBOOK)

Stopping Junk E-Mail

of respondents to a recent PC Magazine Online poll told us they hate junk e-mail and take action to filter it out. 35 percent said they hate it but don't do anything about it; 14 percent said junk e-mail is no big deal.

Virtual Vacations

If you're wondering what the future of e-commerce will look like, check out Corbis (*www.corbis.com*). The brainchild of Microsoft's Bill Gates, Corbis owns or licenses over 23 million images—of which 1.3 million have been digitized and put on the Web. That makes Corbis the largest repository of stock photography and artwork in the world.

Now Corbis is moving toward the consumer marketplace with a number of e-commerce ventures. The Corbis Trip site is a multimedia experience that lets you explore the world by browsing travel photography from the Corbis Collection, reading articles on destinations or artists, and navigating a world map. The photos give you the opportunity to see the world through the eyes of talented photographers. As a virtual vacationer, you can even send electronic postcards for free.

Ultimately Corbis Trip is all about merchandising. At the Corbis Trip Store, a joint venture with Barnes & Noble lets you buy books about your favorite destinations or by your favorite photographers. You can order photos in sizes of your choosing at Corbistore Prints and Posters, or if you decide to forgo armchair travel in favor of the real thing, you can click on over to Microsoft Expedia to book a trip.

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Portal Power: Is This the Web's Future? How well do today's rapidly evolving Web directories and portals deliver the guidance you need? Find out which ones are best.

Have a Laugh With ARF Online Yes, computing can be funny, and Abort, Retry, Fail? proves it. Stop by for a few chuckles.

PC Tech's Top 10 Downloads We keep a running tally of our most popular downloads. Get the utilities that everyone's talking about.

Second Looks: Your Opinion Counts You've used the products, now tell us what you really think. We ask for your opinions every Friday.

New Product News Briefs Who's coming out with flat-panel displays? Heard about the new digital cameras? Bookmark our improved new-product announcements.

Pipeline

Multiple Meetings

Bored with meetings? Maybe you'd stay more interested if you could hop out of one meeting and into the next as easily as you change channels on a television set.

Microsoft vice president Rick Rashid, head of the company's Advanced Technology and Research Group, says videoconferencing applications are high on his list of priorities. Rashid recently showed a video clip demonstrating a *flow application*, a new breed of videoconferencing driven by placing cameras and microphones at every workstation and in every meeting room.

The clip showed a manager accessing video from several meetings, including remote ones, while a written transcript of each meeting was collected in a word processor. Based on the transcript, the manager's computer generated a list of suggested networked files to access, inferred from topics in the meetings.

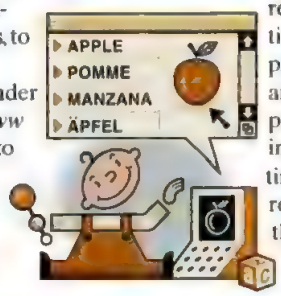
For example, as meeting participants discussed company stock, the computer displayed a file showing the company's earnings report. The video, transcript, and list of related files form what Rashid calls a *flow*.

"Flows can be saved, mailed, and embedded in documents," says Rashid. Who's the target audience? "With several flows open at once, a busy person can be in several places at the same time," says Rashid.

Software for The Diaper Set

If you think 9 months is too early to start kids on the computer, take a look at BabyWow!, a new software package that's designed to expose tots age 9 months to 3 years to language—eight languages, to be exact.

Tony Fernandes, founder of BowWow House (*www.babywow.com*), refers to the software as "infant/toddler stimulation" and is adamant about differentiating it from other packages designed to teach computer skills.



In designing BabyWow!, Fernandes—the father of two kids as well as the founder of Netscape's usability lab—drew upon new research in child development suggesting that between birth and 3 years of age, the brain undergoes its most critical stages in hardwiring and intelligence development.

BabyWow! forgoes the cartoon animations prevalent in most kids' software and instead relies on a collection of over 300 photographs of animals, food, places, and other images that the tiniest tots can relate to. When the parent presses any key (or the baby smashes any combination of keys), a new photo pops up and the program says the accompanying word. Eventually, BowWow House will press custom CDs with your own photos.

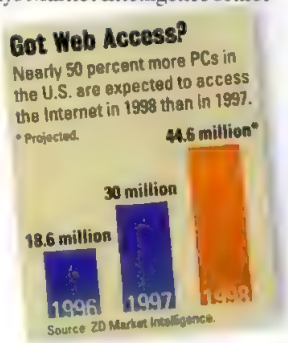
ILLUSTRATIONS BY HARRY CAMPBELL (MIDDLE), BOB DALY (BOTTOM)

THIS ISSUE'S CONTRIBUTORS: *Angela Hickman, Carol Levin, Sebastian Rupley, Luisa Simone, and Don Willmott.*

Over 45 Million Served

A recent report from ZD Market Intelligence (owned by Ziff-Davis, the parent of *PC Magazine*) shows that nearly 45 million PCs in the United States accessed the Internet regularly in the first quarter of 1998, 43 percent more than in the first quarter of 1997.

"The number of PCs that use the Internet has grown more than 140 percent in the past two years," says Market Intelligence senior industry analyst Dave Tremblay, "from 18.6 million in January 1996 to 44.6 million in 1998." And about one in three workplace PCs and nearly one in two home PCs now access the Internet.



Also, according to the report, over 5.7 million PC users have bought PCs or related products on the Web. Nearly 7.7 million have bought other products or services online, more than twice as many as a year ago. Recent data from Intel also shows that getting Internet access is now the number-one reason that consumers are citing for buying a new PC.

Top-Selling Retail Games

1. Starcraft (Cendant Software)
2. Unreal (GT Interactive)
3. Deer Hunter (GT Interactive)
4. Titanic: Adventure Out of Time (Cyberflix)
5. Myst (Broderbund)
6. Might & Magic VI (3DO)
7. Cabela's Big Game Hunter (Head Games Publishing)
8. Army Men (3DO)
9. Star Wars: Rebellion (Lucas Arts)
10. Microsoft Flight Simulator (Microsoft)

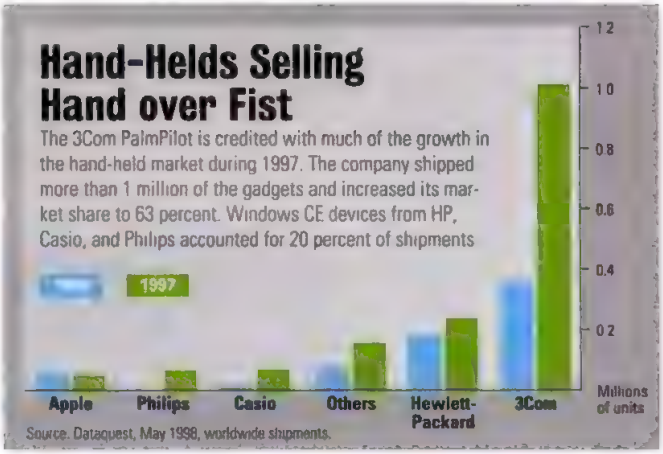
Source: PC Data, data for May, 1998

Who's Calling?

Looking for a new gadget for your home office? Nortel (*www.nortel.com*) has a standard two-line speakerphone that connects to a PC through a Universal Serial Bus (USB) port. You can link Caller ID service up with the $330 Meridian 9617 so when a call comes in, the Personal Call Manager pops up on-screen after the first ring to tell you who's calling. You can also conference two callers through the software, get pager notification of arriving calls, and configure the software to keep records of calls even when your PC is turned off.

Hand-Helds Selling Hand over Fist

The 3Com PalmPilot is credited with much of the growth in the hand-held market during 1997. The company shipped more than 1 million of the gadgets and increased its market share to 63 percent. Windows CE devices from HP, Casio, and Philips accounted for 20 percent of shipments.



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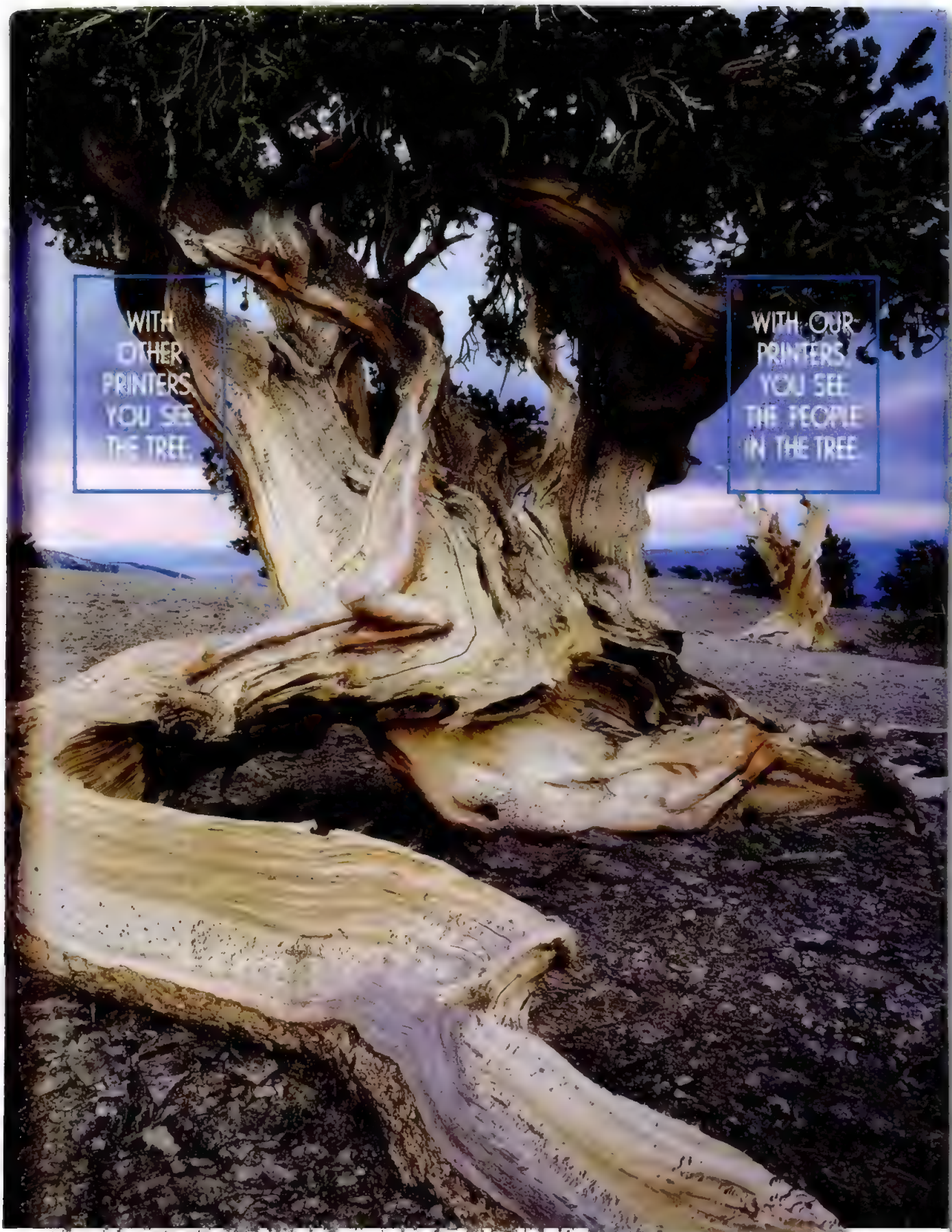
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For contest rules and entry information, visit the 3Com web site: **http://www.3com.com/makeover/pcmag1** Submit your essay as directed on the form. Entries will be accepted between August 1, 1998 and September 30, 1998.

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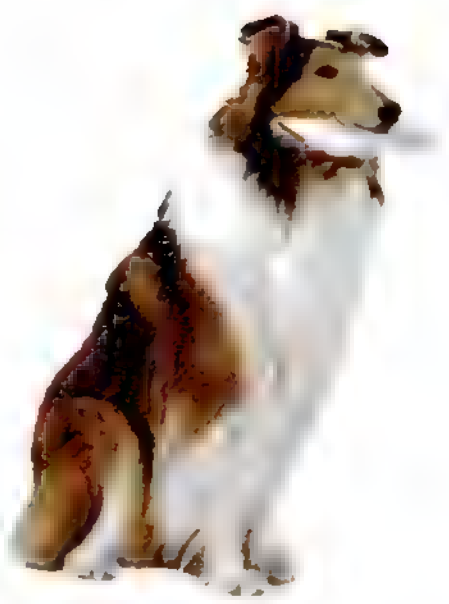
Contest opens August 7, 1998. To enter, visit **www.3com.com/makeover/pcmag1** Complete the on-line entry form and provide an essay in 500 words or less describing why you need a 3Com network makeover. Entries will be judged on the following criteria: (A) Thirty percent (30%)-- Your Business Goals, (B) 10 percent (10%)--Which of the three solutions your business needs, and (C) Fifty percent (50%)--How the solution will help you reach your business goals. Entries must be received by September 30, 1998 at 11:59 EST. Entries become the property of Sponsor, and cannot be returned. Limit one entry per person. Winners will be notified by October 25, 1998. Open to legal residents of the 50 United States, and Canada (excluding Quebec), 21 years of age or older, except employees or resellers of 3Com, Microsoft, Micron, Ziff-Davis, their immediate families, respective affiliates, subsidiaries, agents, advertising agencies and Marden-Kane, Inc. A panel of 3Com judges will select a group of finalists, with the final judging to be determined by Marden-Kane, Inc. All decisions are final and binding. Prizes consist of: Three (3) Grand prizes (one in each category) of $15,000 in 3Com, Microsoft, and Micron equipment (not for resale), for a total approximate retail value of $45,000. Each entrant automatically receives a monitor mirror. Void where prohibited or restricted by law. To obtain complete official rules, send a self-addressed stamped envelop before September 30, 1998, to: 3Com's Network Makeover Contest, PO Box 16216, Encino, CA 91416. Complete rules also appear on the website above.



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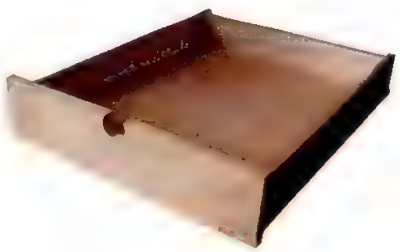

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Letters

BUGGED BY WINDOWS 98

Thank you for your article "What You Need to Know About Windows 98" (June 30, 1998). I am glad to see that someone out there is willing to give readers the straight scoop. I for one will not jump on the bandwagon and get Windows 98 once it is released. Who wants to have the same problems with Windows 98 that there were with Windows 95 when it came out?

J.L. DRONBERGER
via the Internet

I take exception to the fluff previews of Windows 98 done in your (and other) magazines. We've been working with Windows 98, beta 3, for several months and have found software compatibility problems not reported in any review. Also, no reviews that we have seen address what happens when Windows 98 is loaded on older technology.

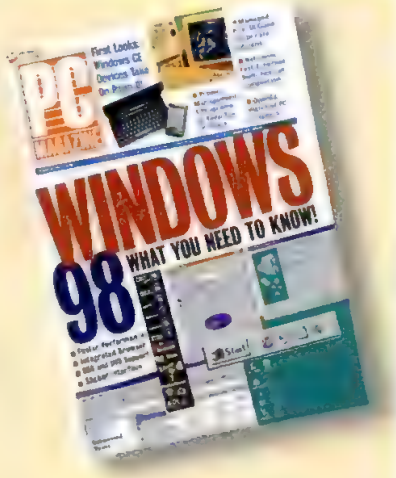
FAT32 would have been the cat's meow back when hard disks were so expensive, but I cannot perceive any compelling added value now. Better technical computer information and minor upgrades to Microsoft disk utilities are great for techies and support people like ourselves. But of what value are they to the average user? Most people couldn't begin to tell you what a system registry is or which 16- and 32-bit programs are loaded into memory, nor do they care. Who actually benefits from this "upgrade"? The value is for all the applications developers who can charge end users to upgrade their software. I'll tell my clients to stay with Windows 95, and we'll plan for Windows NT when it becomes appropriate.

LYNNE STEARNS
via the Internet

Windows 98 will probably be nothing more than another hastily and badly prepared product. Witness your comments, "MS developers claim to have fixed 'more than 3,000 bugs.'" 3,000 bugs? Give me a break! Windows 95 is the most unstable OS I've encountered, and keeping it crash-free is a challenge. Is Windows 98 just another fix for a lame OS, with so-called "enhancements" gleaned from other products already on the market? Mr. Gates owes the consumer a stable OS free of charge. And please, don't direct me to Microsoft's Web site to download files—been there, done that.

MARK L. NICHOLS
via the Internet

Congratulations on bringing the subject of Windows 95's stability into the Windows 98 coverage. It's an issue that has been generally sidestepped by the press. Of course, there's really only one way for me to find out whether



"I'm glad to see someone give the straight scoop."

Windows 98 is more stable than Windows 95, as Microsoft claims: Plunk down my money, install, and pray. Microsoft doesn't have much incentive—in that scenario—to change its ways, does it? In fact, buggy software may improve Microsoft's bottom line, since it results in schnooks like me being eager to take a chance on an upgrade.

RICK ROBINSON
Marietta, Georgia

Software that has bugs is defective, not "buggy." I won't pay to fix defective software, even if I get a few extra bells and whistles. The auto industry has the recall process to fix defective autos. It's time the software industry adopted a similar process.

RANDY DUCLOS
Key West, Florida

THE EVER-ACTIVE DESKTOP

Thankfully, your Windows 98 preview was very honest in saying that most users found the Active Desktop and channel bar annoying. But I think there is even more reason for concern relating to the IE4 integration. For one thing, who came up with the idea to spread interface options throughout Internet, Folder, and Display properties? This makes trying to customize your desktop difficult. But one of the biggest problems is that if Internet Explorer crashes and must be closed by choosing Ctrl-Alt-Del, Windows Explorer is affected as well, causing the tray icons to disappear and sometimes prompting a reboot.

MICHAEL KLEIN
via the Internet

Virtually every feature pictured on the cover of this issue is available in Windows 95. Some come with IE4's Active Desktop, while others came with OSR2. Granted, it's hard to illustrate better performance on a cover, but the illustration only solidifies my stance on Windows 98: Upgrading is not worthwhile.

DAN PHELPS
Amston, Connecticut

SOFTWARE DARWINISM

Your preview of Windows 98 seemed to have a very fundamental contradiction. The introduction says that Windows 98 is an "evolutionary upgrade from Windows 95." The word *evolutionary* implies (to me, at least) that Windows 98 has grown into a higher-level system. Yet most of the following articles mention that the improvements are slight and that many can be added simply by downloading the free Microsoft Internet Explorer 4.0. Although I appreciate the many bug fixes and tweaks that this "upgrade" offers, I have yet to see anything evolutionary about it. And the price is certainly not proportionate to what Windows 98 offers.

CARL KIDWELL
via the Internet

PREDICTION: CYCLE OF FUTILITY

Here's my Windows 98 conversion plan. (1) My current Windows 95 setup, which is unstable enough to lock up at least once a day, will carry its incompatibilities right through to Windows 98. (2) Windows 98 setup will replace functioning hardware drivers with ones that don't quite operate correctly and will overwrite some DLL files that my applications use with new and incompatible versions. (3) Windows 98's 3,000 bug fixes will be balanced, since balance is important, with 3,000 new bugs. (4) Windows 98's "update wizard" feature will lock up my computer halfway through the updating process, trashing the registry and forcing me to boot to DOS and repair the damage manually with a backup registry file. The update may then work the second time I try it, but the updated Windows 98 will repeat steps 1, 2, and 3. (5) After updating Windows 98, I'll be plagued by such frequent lockups that I will simply reformat my hard disk and reinstall Windows 98 and all my applications. (6) Return to step 1.

DAVID STEWART
Auburn Hills, Michigan

PROJECTS, SOFTWARE PURPOSES VARY

Your roundup of project management software in the June 30 issue ("Project Management According to Plan") should not have attempted to find the product that is all things to all people. For companies and managers on a budget, any of the products may be suitable. If

Two heads are better than one.

†BJC-5000 comes standard with one BC-21e and one BC-23 ink cartridge. Additional ink cartridges must be purchased separately. *Estimated street price. Dealer prices may vary. Output shown printed using optional Photo Kit, sold separately. "Bike Adventures" is a fictitious company. Any resemblance to other organizations is coincidental. ©1998 Canon Computer Systems, Inc. Canon and BJC are registered trademarks and Bubble Jet, PhotoRealism and "See What We Mean" are trademarks of Canon Inc. In Canada, call 1-800-263-1121.

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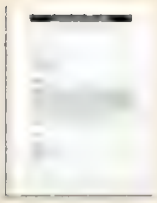

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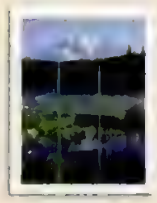

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Letters

you add the criterion of a need for sophistication, most of the products fall short. I have used two of the programs as well as the previous version of Microsoft Project 98. Each product has disappointing flaws. Also, the focus has shifted to publishing on the Web, but little progress is being made in improving output for paper reports.

JOHN HANSEN
via the Internet

As a planning and resources manager for 25 years, I have spent whole working days in and around project management software. The fact that you picked Microsoft Project 98 as the Editors' Choice means that you haven't tested the packages very well. Another reviewed package that is somewhat mediocre, Primavera's SureTrak Project Manager 2.0, is far better than Project 98. I recently took over a Project 98 schedule, which I tried to manipulate. I got such bizarre results that I exported the file to SureTrak to work on it and got better results. Also, how can you not include a British package called PowerProject? I use this daily, along with SureTrak, and they each do different jobs. As a timeline scheduler, there is no better tool than PowerProject.

DAVID BARNETT
Manila, Philippines

HIGH-END DEFINITIONS

The article "High-End Graphics Cards" (June 30) came at a very appropriate time for our office, which is moving to Windows NT graphics workstations for engineering analysis. One of our big concerns has been the class of cards you reviewed. But the article didn't go far enough. In my search, I've found that many terms are thrown around relating to 3-D capabilities, and perhaps the definitions are not standardized. The Summary of Features table indicated which cards support OpenGL but did not say whether they support OpenGL on both Windows NT and 95. The article indicated that all cards were tested on Windows NT boxes, but nowhere did I see that all the cards would support Windows 95. For those of us who are trying to learn high-end graphics card terminology, it is confusing when terms are used in seemingly different ways and no explanation is given.

GARY CHAMBERLAIN
via the Internet

HOW RELIABLE IS TRAVAN?

One important area you missed in your review of Travan and DAT drive backup solutions (Net Tools, "The Drive to Protect," June 9) was reliability. Prior to Travan, QIC backup was terribly unreliable. A lot of drives were sold based on their low prices, but many users found out the cost when restoring data failed. I've been using a Sony DAT drive for about 5 years. It has been 100 percent more reliable than QIC so far, and it's much faster and more capacious than any QIC drive. The big question is this: How reliable is Travan technology? If it continues in QIC's tradition of unreliability, then it is worthless.

DAVE COHEN
Chapel Hill, North Carolina

MORE MONOPOLY DEBATE

How can Jake Kirchner ("Messing with Our Future," June 30) fail to see that monopolies—such as those held by Microsoft and Intel—pose a far more serious threat to the development of innovative products and technologies than any so-called interference by the government? Competition breeds innovation, drives down prices, and encourages quality at the same time. The stranglehold these two companies have on the industry is one of the reasons that we all do not have affordable, superfast microprocessors and a stable, truly multitasking, object-oriented OS today. The monopolist seeks to maximize profits and protect the monopoly, not to bring cutting-edge technology to market. I applaud the government for its actions, and I wish they had been taken sooner. Were it not for Microsoft's dominance, Kirchner's fondly imagined future might not be 100 years away.

MATTHEW GROWHOSKI
Northampton, Massachusetts

Kirchner fails to specify a link between the government's actions and any attempts to "inhibit product development or technological innovation." Instead, he just invokes the mythology of the free market. In Kirchner's version of the myth, the "free market" naturally leads to progress, defined as technological advance. Kirchner's high-tech fetish has warped his values. Technological advance does not mean progress in our future. To speak of our future at all, one must take into account the vast majority of the world's people. In the realm of computing, the important thing for most people is access to information, not access to computing power in and of itself.

STEVE KASNER
Denver, Colorado

TELLING IT LIKE IT MAY BE

John C. Dvorak's article on the end of home PCs ("The End Is Near," June 30) took an open mind and a lot of courage to print. WebTV, which he advocates, is uncomplicated yet powerful. This message, however, will not go over well with the people who have prided themselves on being computer-literate.

DWIGHT HAMPTON
via the Internet

Charles Duell, as commissioner of the U.S. Patent Office, once stated, " Everything that can be invented has been invented." Mr. Duell made that remark in 1899; almost a century later, Dvorak seems to be making a similar proposal. If he thinks we are nearing that once-elusive outer limit, I think he should use a little more imagination. Also, if he really can't find a use for that new 400-MHz machine, he can send it to me. I can surely find something creative to do with it. Before you start unhooking his PC, I have one request: Check out a WAV file in which Homer Simpson asks incredulously, "Computers can do that?"

TY HENDERSON
via the Internet

Corrections and Amplifications

Jim Seymour's June 30 column, "Y2K v. 2: Time for Triage," incorrectly states that January 2, 2000, will come on a Monday, when in fact it will be a Sunday.

In Bill Howard's June 30 column, the last sentence of the second-to-last paragraph should have said, "Drives are so cheap that there's no reason not to get 10GB."

In "2001: Computing in the New Millennium" (June 9), in the section "Home Automation" (page 131), we stated that Intelogis's Passport interferes with X-10. This is incorrect; there is no conflict. In the section "Microprocessors" (page 104), we should have said that Socket 7 has 321 pins. In the sidebar "Intel: Connected Car PCs and the Ultimate Desktop" (page 124), Dave Ryan, Intel Architecture Labs (IAL) technology director, is quoted as saying, "When you have an 80-plus percent market share...." His quote should read, "When you have an 80-plus percent market *segment* share...."

In the June 9 Trends/PCs article "The Latest in Home Designs," the toll-free number for Micron should have been 888-634-8799.

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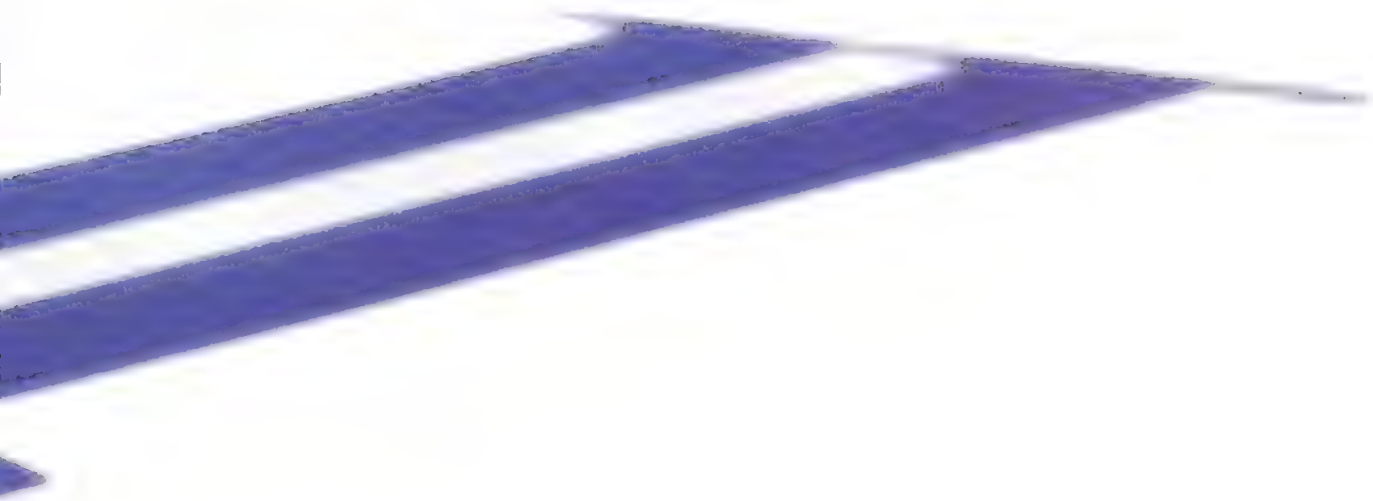

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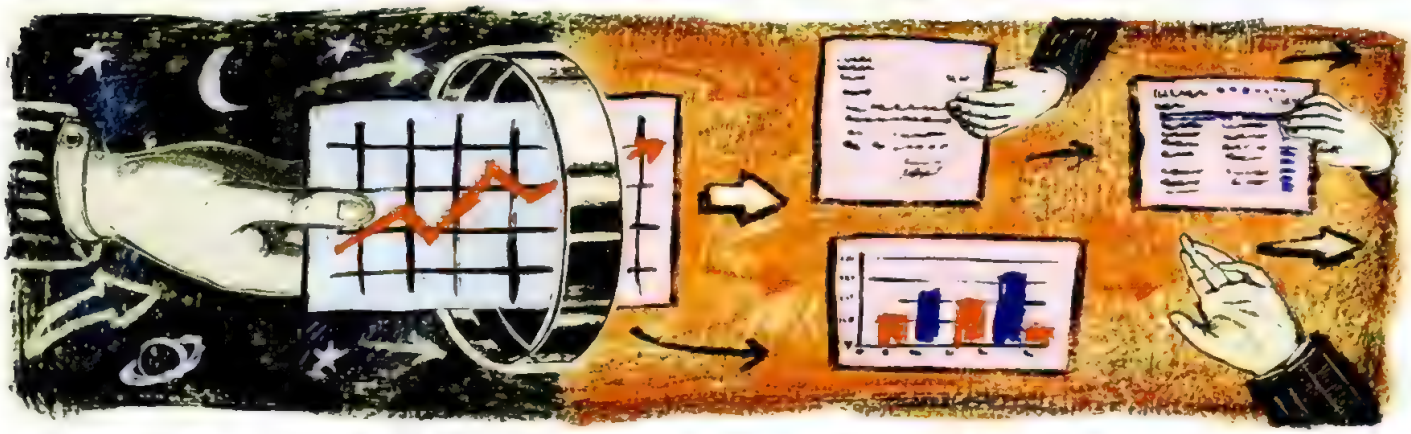
Trends



Office 2000 Courts the Web

Microsoft's latest suite is designed for "round-tripping" between applications and the Web.

New details have emerged about Microsoft's next release of Office, its suite of desktop productivity applications, planned for release early next year. Legions of Excel and Word users can expect much richer integration with the Web and new levels of support for Web standards, including HTML and XML. The next version of the suite that sits on nine out of ten PC desktops running suites also will offer several features targeted at network managers.

The most significant enhancement in Office 2000 is that HTML will become a primary companion file format. The current version of Office supports HTML, but rich document formatting—found in applications such as Word—gets lost when you convert from Microsoft's proprietary file formats to HTML. In Office 2000, you'll be able to view HTML pages with rich formatting and use Office's rich document tools when editing HTML documents.

"We believe that Web documents created by knowledge workers will be as pervasive as printed documents are today," says Jon DeVaan, vice president of the desktop applications division at Microsoft. The new suite also includes subscription and notification functions to alert you when changes have been made to an HTML document. There's also a collect-and-copy feature to let you copy data from numerous files, then paste the information into a single document.

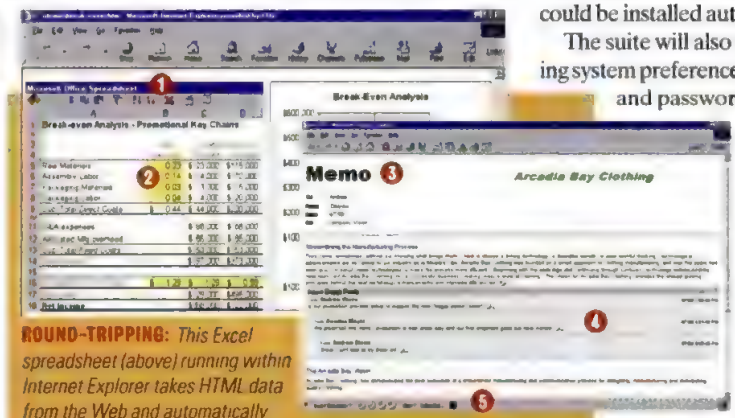
In a further advance in HTML editing, Office documents stored in HTML will enable more precise "round-tripping" to and from Web documents and tables, by implementing Extensible Markup Language (XML) technology to preserve all the Office-specific formatting in a document or table. For example, you could import from the Web a table of stock prices with all formatting intact, via XML tags found in the Web document. "We've built HTML/XML publishing directly into the Office applications, so you can save things in HTML format, or you can roll things back from a Web page that have been stored in XML format," says Microsoft executive vice president Steve Ballmer.

Microsoft's focus on total cost of ownership has brought some changes to Office 2000 as well. The suite will include "self-repairing applications," intended to reduce help-desk calls. Even if you've deleted a critical file within an application, self-repair features will replace the critical file by getting it from a central server. If you're starting with a minimal installation of Word, additional templates or proofing tools could be installed automatically, as needed.

The suite will also support roaming by storing system preferences (such as toolbar settings and passwords) on a server. You'll be able to log on to any terminal on a network and work with a personalized version of the suite. Office 2000 will also allow a run-from-the-server configuration, letting you work within Office without any application files loaded on your local machine.

Office now has more than 90 percent market share among desktop suites, according to market researchers at Dataquest, but some features in competing suites won't be found in Office 2000. Corel and Lotus, for example, have built speech recognition into their suites, but Microsoft won't offer it in Office 2000. And Lotus has built XML-compliant file formats into the new SmartSuite Millennium Edition.

The promised delivery date for the new office suite had been the end of this year, but Microsoft's Steve Ballmer has said that the suite probably won't make it by then. A prerelease version of Office 2000 is currently available.—*Sebastian Rupley*



ROUND-TRIPPING: *This Excel spreadsheet (above) running within Internet Explorer takes HTML data from the Web and automatically formats it for Excel. The Word document in Office 2000 incorporates threaded HTML discussions from the Web. Both these screens are from a prerelease version of Office 2000 and may change.*

1 Excel Spreadsheet
2 HTML data from the Web
3 Word document
4 Threaded Web-based discussion
5 Subscribe to future discussion

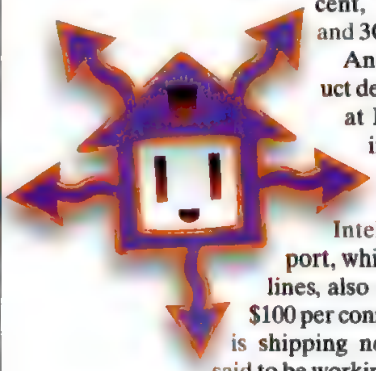
ILLUSTRATION BY BRIAN RASZKA

Digital Living Rooms

Home networking in a snap.

Some 15 million U.S. households have more than one PC, and linking them to each other, to printers, and to the Web should be a snap in the near future. That was one of the key themes of Digital Living Room, a recent industry-insiders conference exploring the possibilities that are arising as Silicon Valley and Hollywood get closer to each other.

The Home Phone Networking Alliance (HomePNA) announced an Ethernet-like 1-Mbps home network based on existing phone wire that should be out by year's end, costing about $100 per connection. Unlike 10Base-T Ethernet, this technology doesn't require routing the wiring back to a central hub, so you can use what's in the walls right now. Tut Systems, in which Microsoft has an equity stake, is developing the first round of products. Epigram is developing a follow-on, compatible 10-Mbps network for late 1999 release. HomePNA backers include many of the industry's heavy hitters: AMD, AT&T Wireless, Compaq, IBM, Intel, Lucent, Rockwell, and 3Com.



Another product demonstrated at Digital Living Room was the 350-Kbps Intelogis Passport, which uses AC lines, also costs about $100 per connection, and is shipping now. Intel is said to be working on a competing technology that would run at 1 Mbps to 10 Mbps, but it recently announced support for phone-wire networking.

For those users who want the highest-speed wiring and want to centralize all entertainment, phone, and network cabling into a single location, IBM showed the Home Network Connection Center. It costs about $1,500 installed in new construction and about two to three times that fitted into an existing house. The companion Home Network Controller lets you monitor security, heating and cooling, and lighting from your PC, TV, or hand-held remote. The Home Network Connection Center in-wall panel, with the surface area of a wall oven but only 6 inches deep, contains a Pentium/233 PC and might cost about $7,500 installed.—*Bill Howard*

A CD-ROM Rating You Can Trust

Life used to be simple. A 1X CD-ROM drive delivered a transfer rate of 150 kilobytes per second, 2X bumped the rate up to 300 kilobytes per second, and so on. The *X* rating has been the most commonly recognized way of classifying CD-ROM drives.

But things started to get complicated. Beyond 12X, the *X* numbers are more about marketing hype than about performance. CD-ROM buyers can no longer ascertain a drive's true performance by its *X* rating. Enter the new ZD Transfer Rate Inspection test, our attempt to restore some sanity in the mad race for a higher *X*.

The difficulty in evaluating the current generation of CD-ROM drives stems from the introduction of *constant angular velocity* (CAV) mechanisms, which deviate from the pure *constant linear velocity* (CLV) design, used in drives that run up to 12X.

With CLV drives, the rotational speed of the disk varies so that the data passing under the read head is constant. This yields a consistent transfer rate from the beginning of the data track (the inside of the disk) to the end (the outer edge of the disk).

With CAV drives, however, the rotational speed stays constant, so that the data passes under the read head faster at the outside of the track than at the inside. (The data is recorded on a track that spirals from inside to outside.)

A 24X CAV drive performs up to 24X *only* at the end of the track; the transfer rate at the beginning of the track, however, is merely 12X. Since a disk isn't necessarily full—there's always data recorded at the beginning but not necessarily at the end—a CAV drive doesn't perform up to its rating consistently throughout the disk, especially where data commonly resides.

Further complicating the matter, some drives use partial CAV mechanisms, which implement some CLV components to boost the transfer rate at the inner track. In order to maintain some integrity, some manufacturers now label their drives with *max* at the end of the *X* rating (as in *24X max*), but the damage has already been done.

THE TRANSFER RATE INSPECTION TEST

To inform buyers better, PC Magazine Labs began to report the transfer rates at both the beginning and the end of the data track, and we are encouraging our readers to use our CD-ROM WinMark tests to rate drives' real-world performance. Now we've added another tool to our arsenal. Ziff-Davis Benchmark Operation has developed the Transfer Rate Inspection test, which maps out the drive's performance over the entire data track.

As seen in the article on Zen Research's new CD-ROM drive on the following page, this new benchmark test was instrumental in proving Zen's claim of a true 40X transfer rate. The new Transfer Rate Inspection test not only reveals the CAV/CLV characteristics of a CD-ROM drive but also exposes flaws in drive design, such as a design that falls back to the lower rotational speed at the end of the disk, where the read mechanism cannot keep up. PC Labs has seen a 32X CAV drive that falls down to 8X near the outer part of the disk.

Unlike the older transfer-rate test, the new test can run with any of your favorite CDs (not just the WinBench 98 CD). And the new transfer-rate test is capable of reporting up to 650 data points, one at every megabyte on the disk.

Now there are fewer places to hide for the PC and CD-ROM drive vendors that want to slip in cheaper and inferior components under the guise of *X* ratings.—*S. Jae Yang*

A Better Transfer-Rate Test

In the past, PC Magazine Labs tested a CD-ROM's data-transfer rate at two discrete points. Now we test continually from the beginning to the end and report multiple rates. This approach better characterizes a CD-ROM drive's performance.

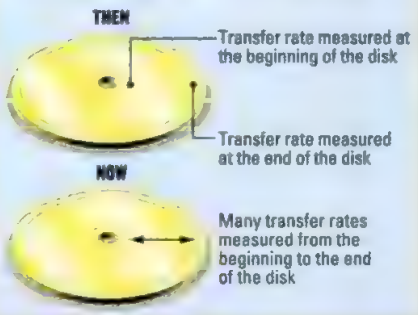
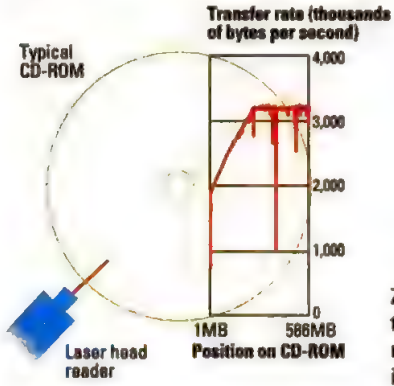


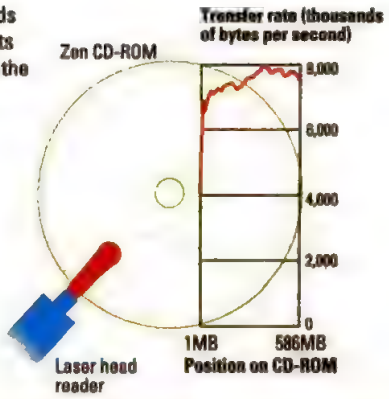
ILLUSTRATION BY JOSE CRUZ; PHOTOGRAPHY BY THOM O'CONNOR

Zen and the Art of The 40X CD-ROM

Spinning the disk faster isn't the only way to speed up performance.

A typical CD-ROM drive follows a single track and reads the data sequentially. Beyond 12X, the drive implements constant angular velocity rotational mode—at least in the inner tracks—yielding less than rated performance.





Zen's TrueX mechanism illuminates a wider area on the disk's surface, reading seven tracks at once. This method closely maintains 40X performance from the inner tracks to the outer tracks.

Just when we thought that CD-ROM drive speed had hit the wall at 32X, Zen Research, based in Cupertino, California, recently delivered TrueX technology, a breakthrough that promises a leap to true 40X. Until now, the only way to gain faster performance has been to spin the disk faster. This brute-force approach, however, is limited. Once the spindle's revolutions per minute (rpm) go beyond 32X, the rotational and thermal stability of the drive mechanism gets flaky.

Zen's TrueX technology is ingenious yet conceptually simple. Instead of spinning the disk faster, the drive reads multiple tracks of data at once. Kenwood is the first company to have announced a CD-ROM drive that will use TrueX. The initial version will spin at a rate equivalent to 12X, but it will read seven tracks at once. The data read out of sequence is patched together by the TrueX chip. The result is true 40X performance from the beginning to the end of the disk.

The advantages of having the TrueX-implemented drive include faster installation of applications and quicker response time in loading multimedia-intensive CD-ROM titles. Zen Research's vision includes 60X CD-ROM and 12X DVD by 1999.—*S. Jae Yang and Laura Cox*

JAKE KIRCHNER

DOJ and Microsoft Should Settle Their Differences

Microsoft has been pummeled regularly in the court of public opinion over the last six months, so it's only fair to note how thoroughly the company has prevailed in the one court that really matters—federal court in Washington.

You've heard about the recent decision in Microsoft's favor by the U.S. Court of Appeals for the District of Columbia, which overturned a lower-court ruling that the company could not force computer makers to install Internet Explorer on their PCs as a condition of licensing Windows 95. What you probably didn't hear is just how devastating this decision was to the Justice Department's continuing antitrust case against Microsoft and how completely the court sided with the company's position.

In the ruling, Microsoft landed every punch and danced away without a scratch. Microsoft argued the lower court had exceeded its authority in the matter; the appeals court agreed. Microsoft argued DOJ had not proven that the company's contracting methods were causing so much harm to its competitors that a preliminary injunction against it was necessary; the appeals court agreed. Microsoft argued it had not been given sufficient opportunity to dispute DOJ's allegations; the appeals court agreed. Microsoft argued that combining a browser with its operating system did not violate the consent decree between the company and DOJ; the appeals court agreed. Microsoft argued the court should not have appointed a special master to investigate the technical issues involved; the appeals court agreed. Microsoft argued DOJ should not interfere with the software maker's "right" to innovate in product design; the appeals court agreed.

It was the court's opinion on the last point that might have been most satisfying to Microsoft executives, who have been traveling the country railing against the government's supposed interference in product innovation. Much of the press covering this issue has lambasted Gates and Co. for allegedly trying to cover up antitrust misdeeds with lofty paeans to innovation. But the appeals court decision blasted DOJ's "antitrust scholars," who it said were acting beyond the "limits of their institutional competence" in trying to tell Microsoft how to design products. In other words, the appeals court said DOJ and the courts should butt out of product design and leave the innovation to those who make a living in the software industry.

The real significance of the ruling is what it portends for the government's antitrust suit against Microsoft, set to go to trial in a matter of weeks. The decision, although limited in immediate effect, will have a devastating impact on the suit. Oh, the government still has some punch left in it, particularly its arguments that Microsoft illegally used a monopoly position in operating systems to hinder competition in the browser market.

The problem for DOJ is what remedies it could propose for any illegal business practices it might prove at trial. Now that the higher court has made clear it won't countenance any government interference in Microsoft's product design, DOJ is left with little in reserve. Given Microsoft's choke hold on the operating-systems market, it can probably live with any restrictions a court might insist on.

If DOJ trustbusters have any sense, they will throw in the towel and try to reach a settlement with Microsoft before the trial. Let's hope for all our sakes that both sides do the right thing and end this fight now.

PHOTOGRAPHY BY SHONNA VALESKA

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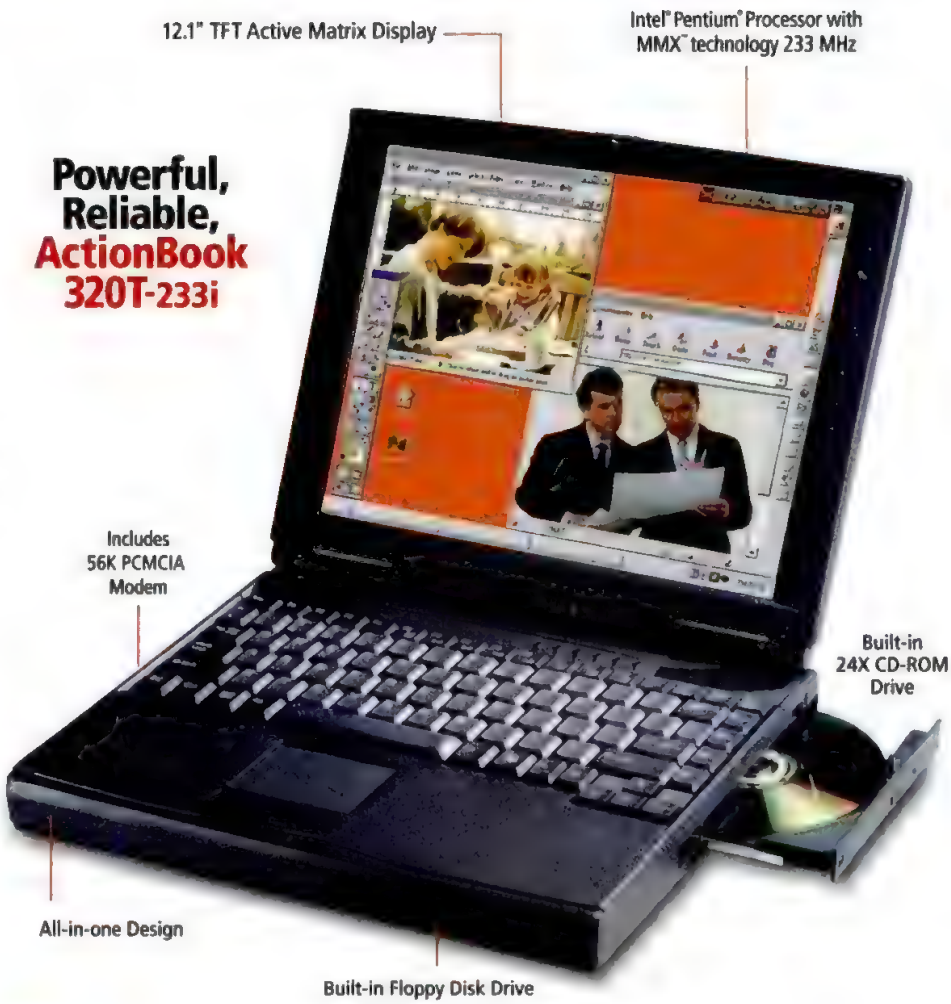

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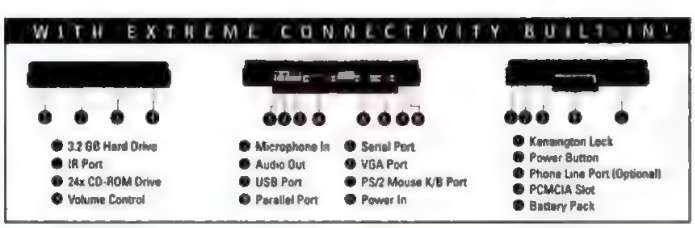

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DESKTOP PCS

Cyrix's Latest Offerings

Between AMD introducing the K6-2 and Intel announcing chips at both the low and high ends, it's easy to forget about the processor market's third major player. Yet Cyrix and its parent company, National Semiconductor, recently made a few strides of their own. Not only is Cyrix now supplying the consumer side of Packard Bell NEC with MediaGX and MII chips, but it also has announced a new PR-333 version of the MII.

The **MediaGX**, now available at 233 MHz, is a value-market chip that goes beyond handling typical central processing duties by integrating a graphics accelerator, an audio subsystem, a memory controller, and a PCI interface. Cyrix's recent agreement with Packard Bell NEC, however, gives the MediaGX new life on the desktop.

Using the chip's 233-MHz incarnation, the Consumer Products Division of Packard Bell NEC is offering two new machines with sub-$800 price tags.

The **NEC Ready 9835** (800-338-9549, *www.nec-computers.com*) is a $799 machine meant for either first time buyers or experienced users desiring performance upgrades. Its base price includes 32MB of SDRAM, a 4.3GB hard disk, a 24X CD-ROM, and a 56.6-Kbps modem; a monitor is sold separately. Priced at an even lower $699 without monitor, the **Packard Bell Multimedia 550** (800-733-5858, *www.packardbell.com*) is outfitted with only 24MB of SDRAM and a 2.1GB hard disk, but—like the Ready 9835—also includes a 24X CD-ROM and a 56.6-Kbps modem.

The Cyrix MII, a classic Socket 7 CPU, debuted earlier this year with a PR-266 rating—meaning its performance ostensibly matches that of a 266-MHz Pentium II. This inaugural chip is at the heart of the **Packard Bell Multimedia 730**, a consumer machine priced at $799. Though the system lacks secondary cache, it boasts 40MB of memory, a 4.3GB hard disk, a 24X CD-ROM, and a 56.6-Kbps modem.

CYRIX AHOY: *NEC and Packard Bell.*

For home and SOHO users desiring slightly higher performance, there's the **Packard Bell Multimedia 850**, which incorporates the newer PR-300 version of the MII, 64MB of RAM, and 512K of L2 cache. This $999 system is also equipped with a 6.4GB hard disk, a 32X CD-ROM, and a 56.6-Kbps modem.

Though Packard Bell has plans to do so in the near future, it does not yet offer the MII's latest version: a PR-333 chip that rivals the 333-MHz Pentium II. But longtime direct seller CyberMax Computer (800-443-9868, *www.cybmax.com*) is using the MII-P333 in two new systems: the **PowerMax B1** and **H1**. Priced at $1,699, the H1 is designed for multimedia and ships with a 19-inch monitor. Its core components—including 64MB of SDRAM, a 6.4GB hard disk, 512K of secondary cache, and an Mpact2 AGP accelerator (with 4MB of memory)—are augmented by a DVD-ROM drive, a PCI sound card, a 56.6-Kbps modem, and two Altec Lansing speakers.

Priced at $1,599, the PowerMax B1 similarly offers 64MB of SDRAM, a 6.4GB hard disk, 512K of secondary cache, and a PCI sound card but opts for an nVidia RIVA 128 (with 4MB SGRAM) and a 32X CD-ROM and includes a 17-inch monitor. CyberMax even supplies, at no extra cost, a Zip drive and your choice of either a modem or a network adapter. *—Cade Metz*

WORKSTATIONS AND SERVER

The Bright Lights of Xeon

At the time of the announcement of its Xeon processor in late June, Intel was still working to repair a minor erratum in the chip's design. Because the bug occurs only with four-way server configurations, Xeon workstations are already available from Dell and Hewlett-Packard.

The chip—a version of the Pentium II with a larger, full-speed secondary cache—is poised to become a major competitor to high-end RISC processors in the workstation and server markets. Beyond those first out the gate, look for Xeon machines from Compaq, IBM, Intergraph, and UMAX—among others—later in the year.

Compaq Computer Corp. (800-345-1518, *www.compaq.com*) will use Xeon in its **Compaq Professional Workstation SP7000**, a machine based on the company's Highly Parallel System Architecture. The system is equipped with two 100-MHz memory buses, dual PCI buses, dual-channel SCSI support, and optimized multiprocessing capabilities. Available in the third quarter, it will also offer clock speeds of up to 400 MHz and up to 4GB of 100-MHz ECC DRAM.

RECAP *For reviews of the first Xeon workstations and servers from Dell and Hewlett-Packard, see First Looks in the issue of August 1998.*

IBM PC Co. (800-426-2968, *www.ibm.com*), which will be offering Xeon in its Intellistation family of Windows NT workstations by the third quarter of this year, is also using the chip in its **IBM NetFinity 7000 M10** server. This four-way server will incorporate hot-swap PCI slots, a dedicated system management processor, predictive failure analysis for key subsystems, diagnostic lights that highlight the way to a malfunctioning component, and what IBM calls "almost limitless disk storage capacity."

At Xeon's introduction, Intergraph Computer Systems (800-763-0242, *www.intergraph.com*)—a longtime workstation player—announced plans to incorporate the chip into its Windows NT–based **Intergraph TDZ 2000 ViZual Workstation**. Precise specifications will be available closer to the product's introduction in the third quarter.

Lastly, UMAX Technologies (800-562-0311, *www.umax.com*) has announced a Xeon version of its **UMAX TekStation** professional workstation, a dual-processor model offering a 9GB Seagate Cheetah Ultra II SCSI hard disk, support for up to 3GB of SDRAM, ELSA GLoria-XXL high performance graphics accelerator, a 32X CD-ROM, and a 10/100 Base-TX PCI Ethernet card. UMAX will sell the system for less than $10,000, depending on configuration. *—CM*

SPEECH RECOGNITION

Speak, Listen, and Learn

Developments in speech recognition technology continue to be regarded with a mixture of optimism and apprehension. There is no question that reliable continuous-speech products will eventually alter our computing experiences. Four new products from the leading players in this market are bringing the revolution one step closer to fruition.

Dragon Systems claims that its new **Dragon NaturallySpeaking 3.0** offers an out-of-the-box experience that is as accurate as the previous version would be after training (800-437-2466, *www.dragonsys.com*). Using Dragon's proprietary BestMatch technology, the software is designed to improve accuracy by 25 percent.

NaturallySpeaking 3.0 comes in three versions: Standard ($109), Preferred ($229), and Professional ($695). The Standard version lets you dictate directly into most Windows applications, while the Preferred version adds business friendly features, including Dragon NaturallyMobile for transcription of recorded speech and text-to-speech for easier editing. The Professional version ups the ante by offering customization, advanced macro support, the ability to add and customize vocabularies, and DragonDictate 3.0. All three products fully integrate into both Microsoft Word 97 and Corel WordPerfect 8. A noise-canceling microphone is included.

The system requirements for the basic Dragon NaturallySpeaking match what the average user may have. But in order to use the BestMatch Technology, the software requires a Pentium 200 with 48MB of RAM and 150MB of hard disk space.

Dragon NaturallySpeaking's vocabulary now includes 62,000 active words and 230,000 additional words on disk ready to be retrieved. Users can customize the vocabulary with up to 54,000 new words, proper names, or specialized terms. Natural Language Commands with Select-and-Say editing allows you to speak commands in a more natural way.

ViaVoice 98 from IBM Corp. (800-825-5263, *www.ibm.com/viavoice*) aims to bring simplicity to an often complicated and frustrating process for computer users. Available in Home ($49.95), Office ($89), and Executive ($149) versions, ViaVoice 98 also features Natural Language Commands for editing and formatting text in Microsoft Word 97.

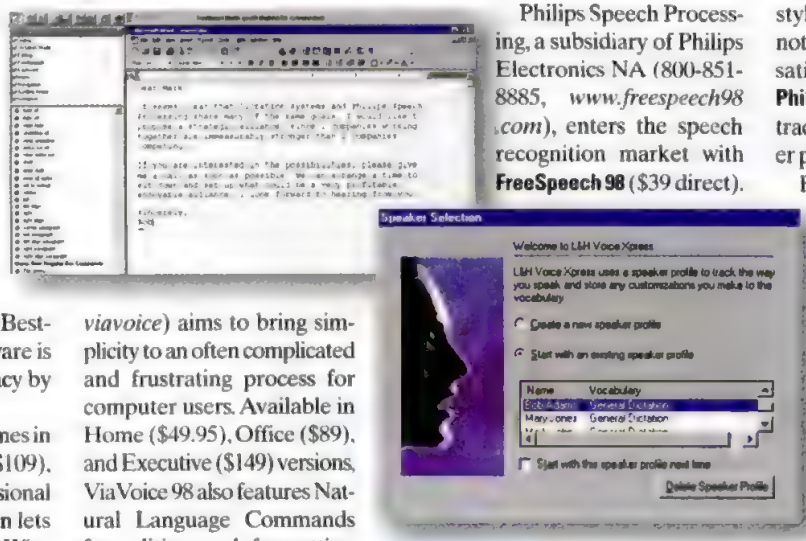
Modeless operation lets you dictate text and issue commands interchangeably without saying extra words. This feature enables hands-free correction and editing without having to switch in and out of dictation mode. The use of Natural Number Formatting means that dictated numbers automatically appear on the screen in the correct format. For instance, if you say "August 17th 1997," ViaVoice 98 recognizes it as a date and formats it appropriately.

Building on that, the Executive and Office editions provide "Say What You See" Navigation, which lets you speak menu commands, filenames, toolbar buttons, and dialog items. ViaVoice also provides improved user assistance and topic support. The integrated feature ViaVoice Transcription provides support for several hand-held dictation devices.

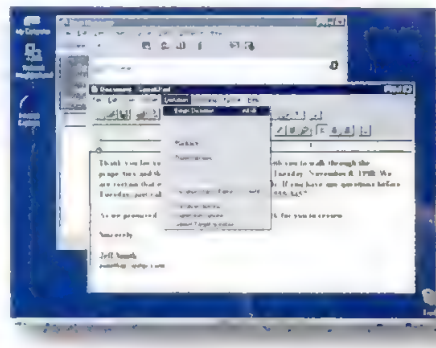
The active vocabulary is 128,000 words, with a backup vocabulary of 260,000 words; that vocabulary can be supplemented with business, finance, and computer-specific dictionaries.

In order to run ViaVoice 98, you'll need a minimum of a 166-MHz Pentium MMX with 180MB of hard disk space and 48MB of RAM (if dictating into Word 97). A noise-canceling microphone is included.

Philips Speech Processing, a subsidiary of Philips Electronics NA (800-851-8885, *www.freespeech98.com*), enters the speech recognition market with **FreeSpeech 98** ($39 direct).



NATURAL SPEECH: *(from top left) Philips FreeSpeech 98, Lernout & Hauspie's Voice Xpress, and IBM's ViaVoice 98.*



Targeted for home and small office PC users using a system running at a minimum of 166 MHz, FreeSpeech 98 allows you to create, edit, and format documents within most Windows applications—including Word 97—as well as control your Windows environment by voice. Philips' synchronous playback feature audibly plays back words and sentences while simultaneously highlighting the selection, letting you proof the text and make changes.

The lexicon includes over 270,000 words culled from the Oxford University Press dictionary. The customizable vocabulary and language model can accommodate 64,000 words, and a built-in tuner analyzes documents for words to add to the vocabulary. The software, which is available in several languages, adapts to the user's voice, dialect, and natural dictation style. Although a microphone is not included, Philips offers the versatile hand-held and standalone **Philips SpeechMike**, an all-in-one trackball, microphone, and speaker priced at $75 (street).

From Lernout & Hauspie Speech Products U.S.A. (800-380-1234, *www.lhs.com*) comes **Voice Xpress** ($50 street) and **Voice Xpress Plus** ($100 street). Xpress and Xpress Plus are continuous dictation products aimed at the general consumer market. They use L&H's Natural Language Technology (NLT), a form of artificial intelligence that interprets users' commands and formats a document as intended.

Xpress Plus adds the ability to navigate and dictate directly into Word. Users can dictate at a rate of up to 140 words per minute. Natural Language Technology provides an easy-to-use command language for editing and formatting documents. The program recognizes numbers, letters, and dollar amounts and can also distinguish dictation from commands without switching between separate modes of operation.

The active vocabulary of 30,000 words can be customized to up to 60,000 words. L&H claims that users can expect 95 percent or greater accuracy with training and regular use. Minimum system requirements include a 166-MHz MMX Pentium, 48MB of RAM, and 130MB of hard disk space. A noise-canceling microphone is included.—*Sharon Nash*

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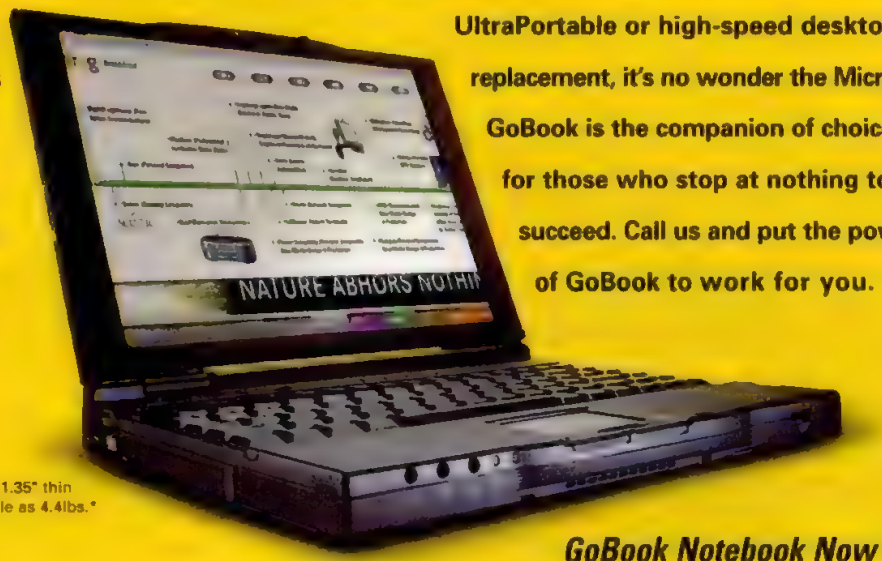

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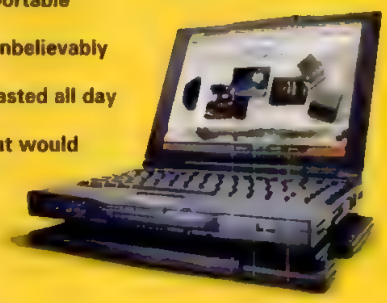

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As the field of medicine continues to evolve at a rapid pace, a generation of physicians are turning to the latest technology to offer better patient care and management. Dr. Amy Alcorn is no exception. As a pediatric resident at the Texas Medical Center, one of the largest and most prestigious medical centers in the world, Amy routinely works over 100 hours a week in a variety of clinical patient settings. To organize her hectic work schedule and what little life she has outside of her job, Amy relies on her Micron™ TransPort Trek™. "If I need medical research, I can get it online virtually anywhere I am. So where I go, my Trek goes. It has become an indispensable part of my life." If you're in the market for a durable, reliable, and affordable desktop replacement notebook that can handle the rigors of any job you can throw at it, give us a call and let us show you what the Micron TransPort Trek can do for you.

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PC World, "Best Buy," April & May '98

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(Trek system featured in photo)

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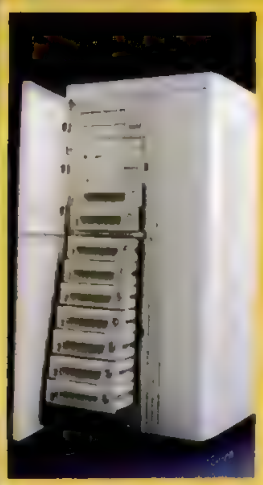

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NETWORK PRINTERS

Better Business Color

We found a lot to like about the current generation of network-able color laser printers in our most recent roundup (May 26, 1998)—better output, lower cost, and enhanced ease of use. Only two shortcomings might have made a business user think twice about deploying one: markedly slower speed for color versus black and white, and paper handling that topped out at legal-size sheets. New color printers from Lexmark and Okidata solve the first problem, and the Lexmark unit also addresses the second concern.

RECAP *PC Magazine*'s May 26, 1998, roundup of 26 network printers included 9 color laser machines. The QMS magicolor 2 CX was our Editors' Choice.

In a typical color laser printer, the paper makes four passes around the imaging drum to pick up each successive layer of toner (one pass each for cyan, magenta, yellow, and black). So if a printer's rated engine speed for monochrome is 12 ppm, it produces a full-color page at only 3 ppm. But the newest color engines employ relatively inexpensive LED arrays instead of lasers for the print heads. The engine can contain four print elements (one per color) arranged in a line, so the paper can move along a straight path to pick up all four colors in a single pass. The output quality is indistinguishable from that of a true laser engine.

RAINBOW: *Printers from Okidata (left) and Lexmark.*

The first two vendors out the gate using this technology are Lexmark (800-539-6275, *www.lexmark.com*) and Okidata (800-654-3282, *www.okidata.com*).

The **Lexmark Optra Color 1200** ($6,000 street) delivers 600-dpi monochrome or color output at up to 12 pages per minute—making it the fastest color laser-class machine available. Just as notable is that it can print color pages up to 11 by 17 inches in size; only a handful of color inkjet printers support ledger-size paper.

The $4,495 **Okidata OKIpage 8c** has a print engine that delivers eight pages per minute in either monochrome or color at 600 dpi. Unlike the Lexmark unit, this printer supports paper only up to legal size (11 by 14 inches).

Both models are fully networkable in a host of environments, and their speeds make them worthy choices for businesses looking to deploy a single printer for use by a workgroup or department.—*Jamie M. Bsales*

LCD MONITORS

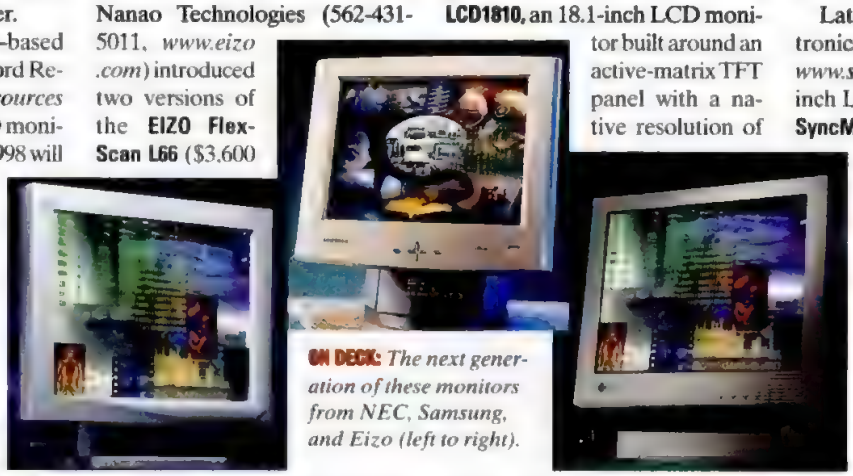
Spacious TFT Screens

Expensive flat-screen LCD monitors represent only a fraction of the desktop monitor market. But in terms of units shipped, they're growing at a breakneck pace of about 50 percent per quarter.

According to San Jose–based market research firm Stanford Resources (*www.stanfordresources.com*), the number of LCD monitors shipped in the U.S. in 1998 will likely total over 160,000—and most will be 14- or 15-inch units, whose screen size and resolution (1,024-by-768) are compatible with those of 17-inch desktop CRT displays. About 3,500 will have 17- or 18-inch screens, which are capable of 1,280-by-1,024 resolution.

Slated for release between now and the end of the year, these 17- and 18-inch models will provide the most direct competition to standard 19-inch and larger CRT screens. The only obstacle is a possible production shortage in Asia, which could make it hard for retailers and system integrators to keep up with demand.

Earlier this summer, EIZO Nanao Technologies (562-431-5011, *www.eizo.com*) introduced two versions of the **EIZO FlexScan L66** ($3,600 street), which features an 18-inch TFT screen with a native resolution of 1,280-by-1,024. One comes with a stationary pedestal that incorporates a USB hub with three plugs for downstream components and one plug for connection to your host computer. The other version has no USB ports but comes with a VESA-compliant bracket for wall-mounting. Both have wide viewing angles of 140 degrees horizontal and 110 degrees vertical.



ON DECK: *The next generation of these monitors from NEC, Samsung, and Eizo (left to right).*

In September, NEC Technologies (800-632-4636, *www.nec.com*) plans to release its **NEC MultiSync LCD1810**, an 18.1-inch LCD monitor built around an active-matrix TFT panel with a native resolution of 1,280- by-1,024. Resting on a VESA-compliant, wall-mountable swivel base, the MultiSync will come with integrated software from Portrait Display Labs that lets you reorient the screen on the fly for portrait or landscape viewing. The monitor will also incorporate Kensington's universal security slot to guard against theft. In addition, NEC's XtraView technology allows for an unusually wide 160-degree viewing angle from both sides and the top and bottom. The monitor should cost about $2,700 upon release.

Later this year, Samsung Electronics America (800-933-4110, *www.sosimple.com*) will offer a 17-inch LCD monitor. The **Samsung SyncMaster 730TFT** will have a native resolution of 1,280-by-1,024 and a viewing angle of 140 degrees. It will also have a four-level power-management system and a VESA-compliant, wall-mountable stand. Pricing will be $3,000 or less. Samsung is also working on an 18.1-inch model to be released in early 1999; 21- and 30-inch models will be available later in the year.

Other vendors offering big-screen LCD displays by the end of this year include Compaq, Sceptre Technologies, and ViewSonic.—*Josh Levy*

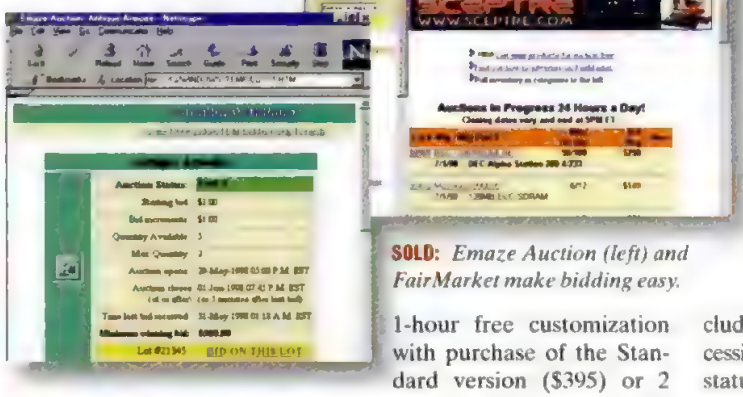
WEB AUCTION

Going . . . Going . . . Gone!

The Web is the ultimate free market, and nowhere is this more evident than in the booming popularity of auction sites, where buyers and sellers meet in an unfettered exchange. Here's the latest from one of the hottest auction sites, as well as new auction software for your own site.

If you're looking to sell or buy excess, new, or used computers and computer products online, you may want to visit **FairMarket's** auction site at *www.fairmarket.com*. All users can register for free and receive a personal My Account page for tracking their sales or purchases. Sellers decide how their goods are listed by setting parameters such as auction start- and end-dates or by setting a reserve price below which an auction lot will not be sold.

Buyers can browse category listings or search for specific products before placing bids. During an auction, buyers are automatically notified via e-mail if their bids have been topped, giving them the opportunity to raise them as needed. At the end of an auction, FairMarket notifies the seller and winning bidder and puts them in touch with each other to work out transaction details. The site charges sellers 2 percent of the winning bid for goods sold on-site; buyers pay no fees.



SOLD: *Emaze Auction (left) and FairMarket make bidding easy.*

Emaze Software's (215-382-2126, *www.emaze.com*) Web-based **Emaze Auction** can help you put your company in the auction business quickly. Companies can either use the auction interface provided by Emaze Software, create their own templates for various pages, or get Emaze's 1-hour free customization with purchase of the Standard version ($395) or 2 hours with the Professional version ($695). Additional customization time can be purchased for $50 an hour.

Emaze Auction features optional auto-bid, which allows bidders to determine the maximum price they are willing to spend and then automatically raises their bids during an auction up to that maximum. Also featured is automatic e-mail, which notifies bidders whether they've won or lost a completed auction. The next release, planned for October, will include extra-cost credit card processing and the ability to check bid status on all items from a single screen.—*Emily Cohen*

When You Need It Now

Tired of the unreliability of traditional e-mail? Several delivery companies have begun to offer online document delivery services, and UPS (800-416-1616, *exchange.ups.com*) is the latest to join the fray against rivals such as Federal Express.

The **UPS OnLine Courier** offers a host of advantages over traditional e-mail. For example, the sender receives verification when the document arrives at its destination, and the sender may specify a password the recipient is required to use to gain access to the document. Another advantage is that a delivery audit trail is created. OnLine Courier is powered by Tumbleweed Software's Posta technology.

UPS OnLine Dossier is an insured electronic delivery service that features a double encryption process to provide a high level of security and verification. It authenticates identities using digital certificates, which are required by both sender and receiver and third-party validation. Rates range from $1 to $7 a delivery. Volume discounts can bring the rates as low as 60 cents per transaction within North America.—*Doug Beizer*

APPLICATIONS DEVELOPMENT

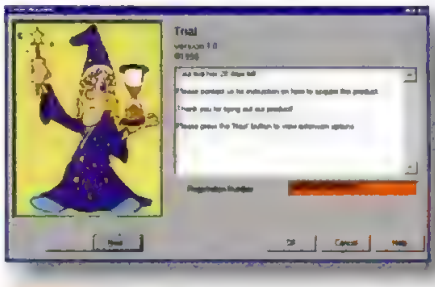
ActiveX Tools

ActiveX controls can be useful tools for developers. **Artisoft's Visual Voice Pro 4.1** telephony toolkit (800-914-9985, *www.artisoft.com/telephony*) helps developers create powerful telephony applications easily. Using ActiveX custom controls, Visual Basic, Visual C++, Delphi, and PowerBuilder language, developers can use Visual Voice ($795 list for 2-line license, $9,995 for 96-line) to answer and place calls, play and record voice messages, retrieve touch-tone digits, analyze caller ID info, transfer calls, and arrange call conferencing. With on-the-fly WAV-to-Vox conversion, developers do not have to create two sets of prompts; plus, this creates options for recording your own voice prompts or using professionally recorded material.

For large installations controlling dozens of phone lines, Visual Voice lets you develop multithreaded apps with VB, VC++, or Delphi for more memory efficient single executables. Visual Voice also provides wizards to automate code creation of common tasks, like voice-prompt menus.

Developers who want to ease the creation of trial versions of their programs should look at Modern Software Publishing's **TrialX Professional Edition** (800-637-6887, *www.modernsoftware.com*). Using two 150K Active X controls, TrialX lets you set time durations down to a function-level granularity.

Once your customer decides to purchase your program, TrialX provides an easy two-key system that lets the customer unlock the full functionality of the program while protecting you from the danger of pass-around copies. You can download a free version from the company's Web site that lets you create 14-day trials of your programs.—*Jay Munro*



TIME'S UP: *TrialX lets developers allow customers to try before they buy.*

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THIN CLIENT SOFTWARE

The Skinny on Thin

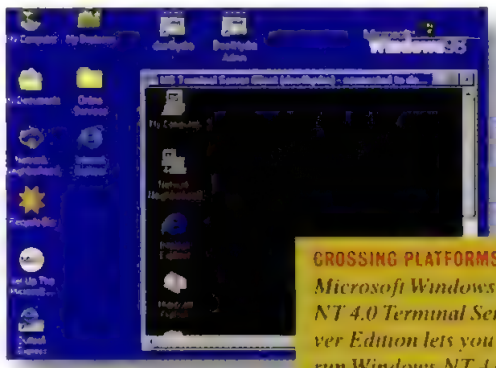
Most TCO pundits cite the benefit of running a single operating system across your enterprise, but making it a reality often means losing a large investment in legacy infrastructure. Now, two vendors, Microsoft Corp. (800-426-9400, *www.microsoft.com*) and Citrix Systems (800-437-7503, *www.citrix.com*), provide solutions that let you run Windows NT 4.0 on almost any platform or system.

The recently shipped **Microsoft Windows NT 4.0 Terminal Server Edition** lets you run the Windows NT operating system on a variety of Windows terminals, 16-bit Windows operating systems, and the standard 32-bit platforms. With this computing model, the client system just provides keystrokes and mouse movements. A central terminal server handles all processing and sends the output to the client. Communications are performed by Microsoft's Remote Desktop Protocol (RDA), which was developed in conjunction with Citrix Corp. Nearly all applications developed for the standard Windows NT 4.0 platform run on the Terminal Edition.

Although there is no hard and fast rule stating how many clients a terminal server can support, on the average a dual 300-MHz Pentium II machine with 512MB of RAM can support from 60 to 90 users running fewer than four simultaneous applications.

Windows NT 4.0 Terminal Server Edition costs the same as the base Windows NT 4.0 package, but the Terminal Edition requires each desktop to have a Windows NT 4.0 Workstation license and a Windows NT 4.0 Server File and Print Client Access License (CAL). Microsoft offers a license of Windows NT 4.0 Terminal Server Edition and 10 client licenses for $1,129.

To extend the Windows NT 4.0 environment across even more platforms—including Macintoshes, Unix systems, wireless devices, and information devices—Citrix Systems offers **MetaFrame** (starting at $4,995 for a 15-user concurrent license). Citrix achieves this cross-platform feat by using its Independent Computing Architecture (ICA) protocol and MultiWin technology, which was licensed to Microsoft to help create Windows NT 4.0 Terminal Server Edition.



CROSSING PLATFORMS: *Microsoft Windows NT 4.0 Terminal Server Edition lets you run Windows NT 4.0 on almost any system.*

Besides the wide platform support, MetaFrame offers seamless integration to the client system, giving you access to all of the local systems' resources so it feels like the applications are running locally rather than remotely. Several management tools let you configure, manage, and update multiple MetaFrame servers and clients across the enterprise from a single seat. Citrix also has a load-balancing feature for multiple MetaFrame servers ($1,495 list per server) and a Secure ICA encryption option ($2,495 list per server).

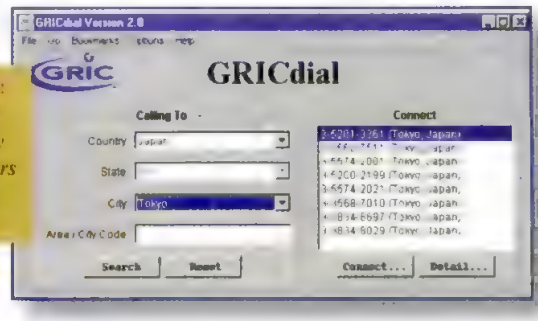
It's important to note that although MetaFrame was designed to operate specifically with Windows NT 4.0 Terminal Server Edition, Citrix also engineered it to be backwards compatible with its popular WinFrame product. *—Robert Daly*

ISP SERVICES

Roam Where You Want To

Roaming is a familiar concept to pager and cellular phone users. It means that you can go anywhere and still receive service, even if you're in another company's service area. Increasingly, it's also becoming a familiar concept for Net surfing, as companies are offering various roaming services through partnerships with worldwide ISPs. With these services, no matter where you go, you can dial into a local ISP and access your home ISP account.

GRIC Communications (408-955-1920, *www.gric.com*) has just released a new version of its Internet roaming service, **GRICtraveler 3.0** ($4,995 per server), which targets corporations and ISPs. You just load the AAS server software onto your network, and GRIC provides your users roaming access to the over 300 member ISPs in the GRIC Alliance. To help you track expenditures, GRIC also keeps detailed accounts of individual usage and any incurred costs.



GLOBAL CONNECTIONS: *Services like GRICtraveler make it easy for corporate travelers to dial in from anywhere in the world.*

New in Version 3.0 is SSL 3.0 support, which provides secure information transfer between clients and the server. Each server license comes with unlimited usage of the free client software, GRICdial and GRICcm. GRICdial is a Java-based application that runs on Windows and Macintosh platforms, whereas GRICcm is a special version of Microsoft Connection Manager for Windows 95 and Windows NT that includes PPTP support for VPN connections. Both clients get regular updates with the most complete list of GRIC Alliance ISP numbers.

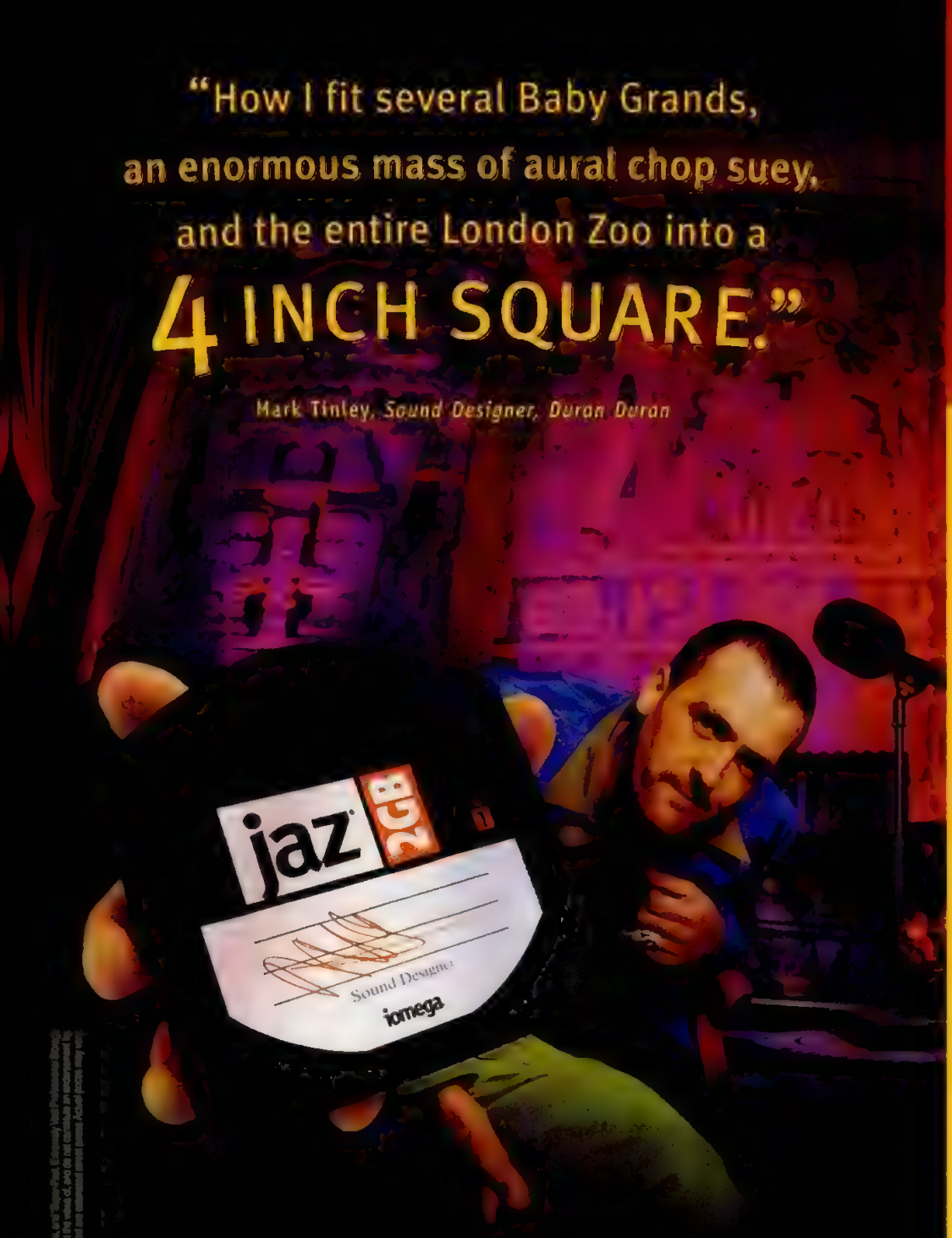
For something more business-specific, Fabrik Communications (800-732-2745, *www.fabrik.com*) offers **Fabrik Remote** ($6.95 per month per mailbox, plus $3.20 per hour roaming access). This service lets corporate users access their company e-mail and LDAP directories from anywhere in the world, thanks to a partnership with the iPass roaming service. iPass has more than 3,000 locations around the world.

Fabrik Remote supports any IMAP4 or POP3 clients and all Lotus and Microsoft mail servers. The company maintains a mirror of the user's mail directory at its messaging center, making the directory available to the user anywhere in the world. In addition, when users dial in to the service, they also have access to their company's LDAP directory just as they would if they were in the office. Rather than using an e-mail client, users can instead access and fully utilize their corporate e-mail and directory through a Web browser.—*Michael N. Rusignuolo*

"How I fit several Baby Grands, an enormous mass of aural chop suey, and the entire London Zoo into a

4 INCH SQUARE."

Mark Tinley, *Sound Designer, Duran Duran*



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	CRT monitor Model/ Viewable Area	TCO	Dot Pitch/ CRT Type	Max. Horizontal Scan Rate	Max. Resolution	Est. Street Price
21"	VisionMaster Pro 502 (19.5" VIS)	TCO '95	0.28mm/AG	110khz	1800 x 1440@74hz	$1,059
	VisionMaster Pro 501 (19.5" VIS)	TCO '95	0.28mm/AG	96khz	1600 x 1200@75hz	$999
	VisionMaster 502 (19.5" VIS)	TCO '95	0.27mm/dp	110khz	1800 x 1440@74hz	$1,059
	VisionMaster 501 (19.5" VIS)	TCO '95	0.27mm/dp	96khz	1600 x 1200@75hz	$999
19"	VisionMaster 450 (18.0" VIS)	TCO '95	0.26mm/dp	102khz	1600 x 1200@80hz	$699
17"	VisionMaster Pro 400 (16.0" VIS)	TCO '95	0.25mm/AG	96khz	1600 x 1200@75hz	$529
	VisionMaster 400 (16.0" VIS)	TCO '95	0.26mm/dp	96khz	1600 x 1200@75hz	$489
15"	VisionMaster 350 (13.7" VIS)	MPR-II	0.28mm/dp	69khz	1280 x 1024@65hz	$248

	TFT/LCD monitor Model	TCO	Pixel Pitch	Max. Horizontal Scan Rate	Max. Resolution	Est. Street Price
14.1"	Pro Lite 36	TCO '95	0.279mm	62.5khz	1024 x 768@75hz	$998
15"	Pro Lite 36a	TCO '95	0.279mm	62.5khz	1024 x 768@75hz	$1,498
	Pro Lite 36b (with USB & Speaker)	TCO '95	0.279mm	62.5khz	1024 x 768@75hz	$1,698

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1998 VisionMaster 450

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January 6, 1998 VisionMaster Pro 17

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PC Computing ★★★★★ May 1998 VisionMaster 450

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CNET CERTIFIED March 1997 VisionMaster Pro 21

PC WORLD Seven Time Winner July 1996, Jan 1997, March 1997, July 1997, Sept 1997, Jan 1998, May 1998 VisionMaster Pro 17 April 1998 VisionMaster 450

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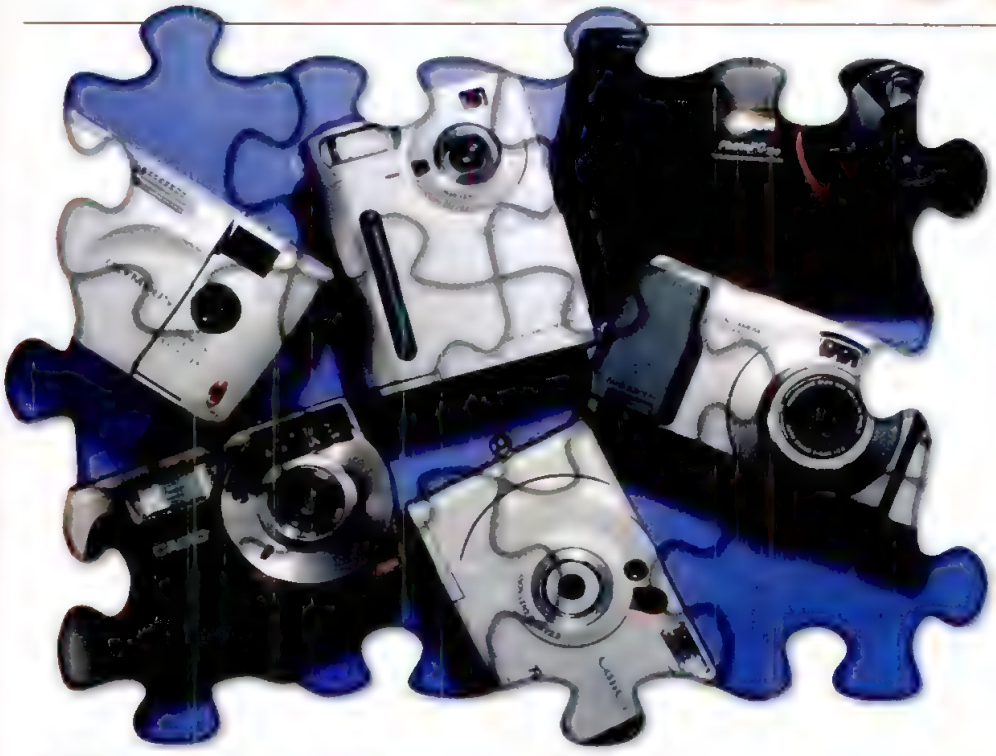
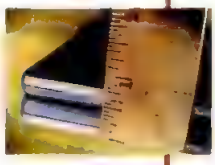
First Looks



INSIDE

SLIMLINE NOTEBOOK: Sony's VA10 505-GX measures less than an inch thick, giving new meaning to portability. See *page 53* for the review.



TALK SUITE: Lotus SmartSuite Millennium Edition includes IBM ViaVoice Gold. Corel WordPerfect Suite with Dragon NaturallySpeaking also enables voice-recognizant word processing. See *page 60*.

PRINT BIG PHOTOS: The Epson Stylus Photo EX outputs 1,440-by-720 dpi and 11-by-14-inch photo prints. See *page 64*.

More Products Reviewed . . .

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PC MAGAZINE ONLINE

PHOTOGRAPHY BY THOM O'CONNOR

All About Megapixels

Affordable megapixel digital cameras are now taking the marketplace by storm. PC Magazine Labs tests six new models priced at $800 or less.

By Daniel Grotta and Sally Wiener Grotta

Just last year, only a handful of entry-level, sub-$1,000 digital cameras offered megapixel sensors or resolution. Although low prices ensure the continued popularity of VGA and SVGA cameras in the short run, the industry's slow shift toward affordable megapixel digital cameras has turned into a veritable stampede.

A megapixel digital camera refers to a device that uses a CMOS or CCD (charged-couple device) sensor with a density of at least one million pixels or a device that's capable of capturing images at a resolution of 1,024-by-768 or higher. Either way, it adds up to any digital camera that can output a 5- by 7-inch photo-quality color print—or larger—without pixelization.

Although there are no hard-and-fast industry standards, the marketplace has dictated a set of features that are common to most megapixel digital cameras, including the six units here. Each comes equipped with a built-in electronic flash, both optical and LCD viewfinders, video out, exposure compensation, Mac and PC support, a serial interface, and an auto-focus lens with macro capability and a digital telephoto mode.

All also have a preview mode and are Twain compliant; most permit multi-image displays. And with the exception of the Casio QV-5000SX—which features a nonexpandable 8MB of internal flash RAM—all can store images to removable CompactFlash or SmartMedia cards using standard JPEG format (the levels of JPEG compression vary).

As similar as these six units are, the differences surface in the subtleties each camera offers. For example, the Canon PowerShot A5 can save raw, uncompressed images for the highest picture quality. The Casio unit has a movie mode for recording video. The Epson PhotoPC 700 comes with a lens adapter ring that accepts optional wide-angle, close-up, and telephoto lenses and filters. The Fujifilm MX-700 has the largest, densest CCD in its class.

There are other practicalities, too. An important note for left-eyed users: The Canon and Epson optical viewfinders are awkwardly positioned near the center of the camera, forcing

you to rest your nose on the LCD or mode dial.

TESTING—1, 2, 3 . . . SHOOT

Most of the cameras did well with our test shot; and as with their respective feature sets, each camera offered a slightly different twist on the results. The Epson PhotoPC 700 produced the best image—sharp, well-lit, with accurate and pleasing colors. The Fujifilm MX-700 captured the greatest detail and its exposure was right on, but there was a slight yellowish cast to the image.

The Olympus D-340L exhibited an impressive dynamic range, though the image lacked "snap" and the colors were slightly muted. The Casio QV-5000SX image had good, crisp details in both highlights and shadows, but some of the brighter midtones were washed out. Although the contrast makes the image appear sharp and detailed, the Panasonic PalmCam's colors were dull and inaccurate. Because it is overexposed by almost two stops, the Canon PowerShot A5's image was somewhat washed out; details were lost and colors were off.

Determining which camera is best for you depends on what you want to do with it.

Our nod for Editors' Choice goes to the Fujifilm MX-700, for its combination of excellent image quality, advanced ergonomics, and high-resolution CCD. The Epson PhotoPC 700 rates honorable mention for best image and ease of use.

Canon Computer Systems Inc.

Canon PowerShot A5

Canon PowerShot A5
Street price: $700
Requires: 24MB RAM, 135MB hard disk space, Microsoft Windows 95, NT 4.0 or later, available serial port, CD-ROM drive
Canon Computer Systems Inc., Costa Mesa, CA; 800-652-2666, 714-438-3000
www.powershot.com
400 at www.pcmag.com/infolink

Similar in size and shape to a cigarette pack, the Canon PowerShot A5 ($700 street) expands on its predecessor's features by offering an active-matrix LCD, a maximum resolution of 1,024-by-768, panorama mode, and a burst mode of 1 frame per second (fps).

For all of its improvements, the A5 has significantly less storage capacity compared with its earlier incarnation, the PowerShot 600. Whereas the PowerShot 600 included a 170MB Type III PC Card hard disk that could save up to 3,000 images, the A5's capacity is limited to the included 8MB CompactFlash card, which can store up to 236 images.

The A5's aluminum case has the look and feel of a quality instrument, down to the motorized metal flap that protects the lens. There's no rubberized hand grip, but the recessed semicircle in front and the slight contour in the back make it easy to hold and shoot the camera one-handed.

Paging through the LCD menu is fast and simple, though the nomenclature (large, small) describing image quality and resolution can be confusing. Although the A5's nickel hydride battery may be swapped out in seconds and recharged in 90 minutes in its external cradle, it cannot be recharged in the camera while the unit is connected to the AC adapter.

There are five different image-quality resolution and compression combinations: 1,024-by-768 at fine or normal; 512-by-384 at fine or normal; and raw. Raw, uncompressed images (940K) are saved in Canon's proprietary CRW format, which can be read only by Canon's driver. The ability to save raw images helps compensate for the fact that, with 810,000 pixels, the A5 has the lowest-density CCD of the cameras tested in this roundup.

When Program Mode is selected, you may shoot at 1 fps for up to 15 frames; however, image resolution is limited to 512-by-384. Stitch Assist Mode is useful for shooting panoramas, as it displays in the LCD viewfinder where to move the camera in order to overlap frames. Depending upon shooting conditions, the ISO equivalency (sensitivity to light) switches between normal (100) and low-light (400).

Shooting an image with the A5 is not instantaneous, but in most circumstances, the camera's 1/2 to 3/4-second lag isn't long enough to become frustrating. The recycle time between frames is a ho-hum 10 seconds, unless you are shooting in the burst mode.

All in all, we found this camera easy and intuitive to use. Where the unit disappoints is in its less-than-perfect picture quality when shooting in the default mode, when the A5 tends to overexpose and thus slightly wash out images.

SUMMARY OF FEATURES See **www.pcmag.com** for interactive views

Megapixel Digital Cameras

	Canon PowerShot A5	Casio QV-5000SX	Epson PhotoPC 700	Fujifilm MX-700	Olympus D-340L	Panasonic PalmCam PV-DC1580
Price	$700 street	$600 street	$700 street	$799 list	$700 street	$599 list
Resolutions	1,024 x 768; 512 x 384	1,280 x 960	1,280 x 960	1,280 x 1,024, 640 x 480	1,280 x 960; 640 x 480	1,024 x 768; 512 x 384
Number of CCD Pixels	810,000	1.3 million	1.3 million	1.5 million	1.3 million	1 million
Close-up distance (macro mode), in inches	3.5	3.9	4	3.5	4	5.5
Memory and Type	8MB CompactFlash	8MB internal	4MB internal	2MB SmartMedia	4MB SmartMedia	8MB CompactFlash
Recording modes	Burst, panorama, single	Movie, panorama, single, title	Black & white, continuous, digital zoom, panorama, single	Black & white, continuous, single	Panorama, sequential, single	Sequential, single, wide angle
Image capacity in highest available resolution	8 (uncompressed)	16 (compressed)	7 (compressed)	2 (uncompressed)	9 (compressed)	40 (compressed)
ISO equivalency	100, 400	100	60, 120	100	60, 120	100
Shutter speed range	1/6–1/750	1/8–1/500	1/4–1/500	1/4–1/1,000	1/2–1/500	1/4–1/2,000
Approximate recycle time without flash	10 seconds	10 seconds	6 seconds	7 seconds	6 seconds	12 seconds

Casio Inc.

Casio QV-5000SX

The Swiss Army knife of digital cameras, the Casio QV-5000SX ($600 street) captures stills, movies, and panoramas, in addition to allowing you to make titles and program business presentations that combine pictures, text, or graphics prepared in any presentation program. The QV-5000SX's versatility is appealing, but the usefulness of some features is limited by the camera's complexity, nonremovable memory, short battery life, and slow upload time.

The QV-5000SX comes with 8MB of flash RAM, the most built-in memory of any digital camera. That's enough storage for 15 high-resolution images and up to 6.4 seconds of video. There's no provision for removable memory cards, however—a considerable drawback given that the camera's serial interface is then the only way to download to a computer, and that process can take a half-hour or more, depending upon the baud rate. The video mode's practical value is further diminished by the inability to record audio.

When using the camera, be prepared to need extra batteries, because the QV-5000SX uses up double-A alkalines at a fast clip. For downloads, you'd likely want to purchase the optional AC adapter.

The camera's optical viewfinder is the best of all the cameras featured in this roundup. It displays bright-yellow frosted marks, which include parallax marks for close-ups. The body is made of a high-impact, dark-gray polycarbonate, and the lens is centered in a gunlike semicircular polished metal disk that offers an effective way to feel if your finger is inadvertently blocking the lens. Although there's no movable cover, the lens is protected by a permanently positioned UV filter. The battery compartment is contoured for a positive grip and is aided by no-slip black plastic trim. Like the Canon unit, the QV-5000SX has a hand-strap grommet that swivels, but it looks and feels insubstantial.

All buttons and controls are well positioned and clearly marked. The zoom button is instantly accessible and very easy to use. On the other hand, paging through the different modes—panorama, video, title—displays unfamiliar icons rather than words on the LCD, making it difficult to be certain exactly what and how an image is being captured. The digital, video, and power ports are protected by a magnetic flap when not in use.

Shooting images with the QV-5000SX is simple, but the proper usage of some options is unclear. For instance, you can select three levels of sharpness, although without a detailed explanation of what sharpening is and how it works, an amateur could end up with a mushy or contrasty image.

The camera's image quality is average relative to the other products in our roundup; but that's significantly better than any earlier Casio camera. This time around, Casio has delivered an easy-to-use point-and-shoot device that's a great choice for capturing conventional stills.

Casio QV-5000SX
Street price: $600
Requires: 16MB RAM, 50MB hard disk space, Windows 98, available serial port, CD-ROM drive
Casio Inc., Dover, NJ; 800-962-2746, 973-442-5707
www.casio.com
401 at www.pcmag.com/infolink

Epson America

Epson PhotoPC 700

The latest camera to be offered by Epson America is the Epson PhotoPC 700, a large, strange-looking asymmetrical device with a knurled, disklike ring around the lens. But don't let this camera's unconventional looks fool you: High-quality images and ease of use make the PhotoPC ($700 street) worthy of being our honorable mention for this roundup.

The camera turns on and the lens is exposed when the ring around the lens is twisted. The case, including the tripod socket, is made almost entirely of black plastic. There's no rubberized grip for your hands, although the rounded battery compartment in front and the indent in back help guide your fingers and thumb into the correct position. Although the unit can be shot right-handed, it is designed to be operated with both hands. The viewfinder has black frame marks for the digital zoom, but they're almost impossible to see in low light.

The PhotoPC comes with 4MB of built-in flash RAM, enough to capture seven high-resolution color images. It also accepts optional CompactFlash cards. For both speed and convenience, the camera can move images between the built-in memory and the CompactFlash memory, making it easier to transfer images to your PC.

The company takes advantage of the synergy between its divisions by designing the camera so you can output directly to certain Epson printers. Unfortunately, this setting uses up more

Editors' Choice

• Fujifilm MX-700

PC MAGAZINE EDITORS' CHOICE

Although each of the cameras reviewed in this roundup brings something different to the table, a combination of advanced ergonomics and high resolution make the Fujifilm MX-700 stand out as our Editors' Choice. The MX-700 looks and feels like the high-quality precision instrument it is. The unit's design makes it comfortable for shooting single-handed, and the viewfinder's location is convenient for left- and right-eyed users. The compact size is an added convenience that makes it second nature to stow the camera in a shirt pocket. Not only can you capture and store uncompressed images, but you can also choose to take black-and-white, sepia, or color images, as well as manually set white balance for better color. Equipped with the largest, densest CCD in its class, the MX-700 generates large image files, ensuring that its images are sharper, more detailed, and better defined than any other camera in our roundup.

The Epson PhotoPC 700 earns honorable mention by proving that size doesn't always matter. True, its CCD is smaller and less dense than the Fujifilm MX-700's CCD, and its resolution isn't as great, but the PhotoPC 700's color and exposure were judged the most accurate and pleasing.

memory and consequently allows users to record fewer images (the Direct Print program can be removed from the camera).

There's both good and bad news with respect to battery life. The good news is that the PhotoPC comes with four rechargeable nickel hydride double-A batteries and a compact, cordless AC charger. The bad news is that the batteries must be charged three times before the first use (a process which takes 6 hours), and subsequent recharges will require 2.5 hours to bring the batteries back to full capacity. Epson warns that you should wait an additional hour before removing and using the recharged nickel hydride batteries, so they may properly cool down. But you can avoid this tedious procedure and start shooting immediately when using standard alkaline or lithium double-A's.

Using the LCD menus and Select functions can be confusing. Paging through the Select functions (panorama, zoom, white balance) does not make sense until you figure out that the Back button is really the Set button. Switching between the picture settings using the control panel and buttons on top of the camera is fast and simple, however.

Aside from normal 1,280-by-960 megapixel capture, the PhotoPC has several additional capture modes and functions. Its burst mode can capture up to 10 images at 2 fps; in this mode, the resolution is automatically reduced to 640-by-480 and the flash is turned off. You can shoot in three different color settings or two monochrome settings, for continuous-tone black-and-white images. When shooting with available light, you can manually switch to a higher ISO equivalency (the maximum ISO is 120).

Taking pictures with the PhotoPC is a no-brainer: Twist the front disc to open the lens, then point and shoot. The camera's sharp, detailed images and accurate colors mean you'll be confident about the images you're capturing time and again.

Epson PhotoPC 700

Street price: $700

Requires: 16MB RAM, 30MB hard disk space, Windows 3.1 or later, available serial port, CD-ROM drive

Epson America Inc., Torrance, CA 800-463-7766, 310-782-0770

www.epson.com

411 at www.pcmag.com/infolink

Fuji Photo Film U.S.A, Inc.

Fujifilm MX-700

PC MAGAZINE EDITORS' CHOICE

Once you get past the flashing, gimmicky lights on power-up, you'll find that the Fujifilm MX-700 ($799 list) digital camera is a stylish, sophisticated, elegantly simple digital camera. Add to this its high image quality, and you'll understand why this camera earns our Editors' Choice for this roundup.

Supporting 1.5 million pixels, the MX-700 captures images at 1,280-by-1,024, the highest resolution of any of the cameras we tested. With so much possibility contained therein, the camera's greatest limitation is that the low-density 2MB SmartMedia card which ships with the camera can record only 2 images in the best-quality (uncompressed) mode.

An ultracompact, silver metal device, the MX-700 literally fits into a shirt pocket. The sleek unit has rounded edges and rubberized front and back grips that help facilitate one-handed shooting. The camera's viewfinder is clear optical glass, with a circle in the middle, and no frosted frame marks for close-ups or zoom.

There are lots of buttons and dials, but except for the setup, menu, power, and select buttons, all are identified by abbreviations or icons. Moving your thumb over the mode dial is convenient, as is navigating through the selections via the four-way rocker switch. Those with less-than-perfect eyesight will find the small LCD control panel on top difficult to read.

So far, the MX-700 is the only digital camera available that uses both 3.3V and 5V SmartMedia cards. Unfortunately, it's easy to insert the card backwards, and you could conceivably operate the camera that way—without recording any shots.

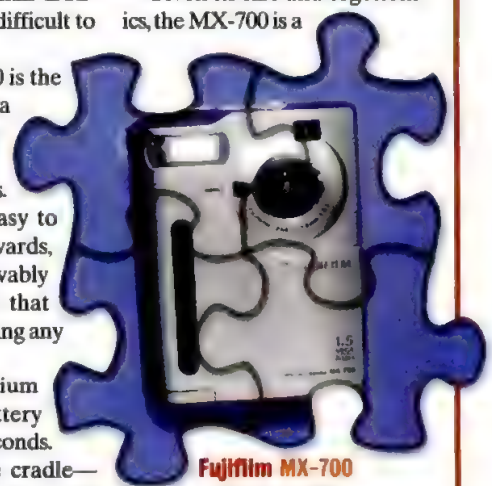
The camera's lithium ion rechargeable battery can be swapped in seconds. There's no recharge cradle—just plug in the AC adapter in the side of the camera. It takes 7 hours to recharge the battery—or 2.5 hours if you buy the optional, external charger.

Like the Casio unit, the DX-700 has a sharpness mode (normal, soft, and hard) for setting the outlines in an image. There are manual modes for setting flash brightness, exposure compensation, and five white balances: outdoor, shade, fluorescent 1, fluorescent 2, and incandescent. Exposure compensation is in one-third stops, from -0.9 to +1.5. It's confusing to know which of the different manual modes to use; however, you can use the LCD to preview how the different modes affect the image. The flash power allows you to set degrees of brightness, which is useful when shooting close-ups and highly reflective subjects.

The continuous mode lets you shoot 16 fast shots in a single frame (such as a golf club swing). Depending upon the setting, it can take 16 shots in either 2 or 4 seconds. The flash will not fire in this mode.

Given that its 1.5 million pixel CCD captures the most data of the cameras we tested, we expected the MX-700 to yield the sharpest, most detailed images of all the cameras in our roundup. It did—by a fair margin. Only its slight shift toward yellow kept the MX-700 from scoring tops in our image-quality test.

Given its size and ergonomics, the MX-700 is a pleasure to use. It's unobtrusive for candids and can easily be stowed and retrieved from a pocket or purse. Couple that with excellent image quality, and you have an Editors' Choice winner.



Fujifilm MX-700

List price: $799

Requires: 8MB RAM (16MB recommended), 75MB hard disk space, Windows 95 or later, available serial port, CD-ROM drive

Fuji Photo Film U.S.A. Inc., Elmsford, NY, 800-378-3854, 914-789-8100

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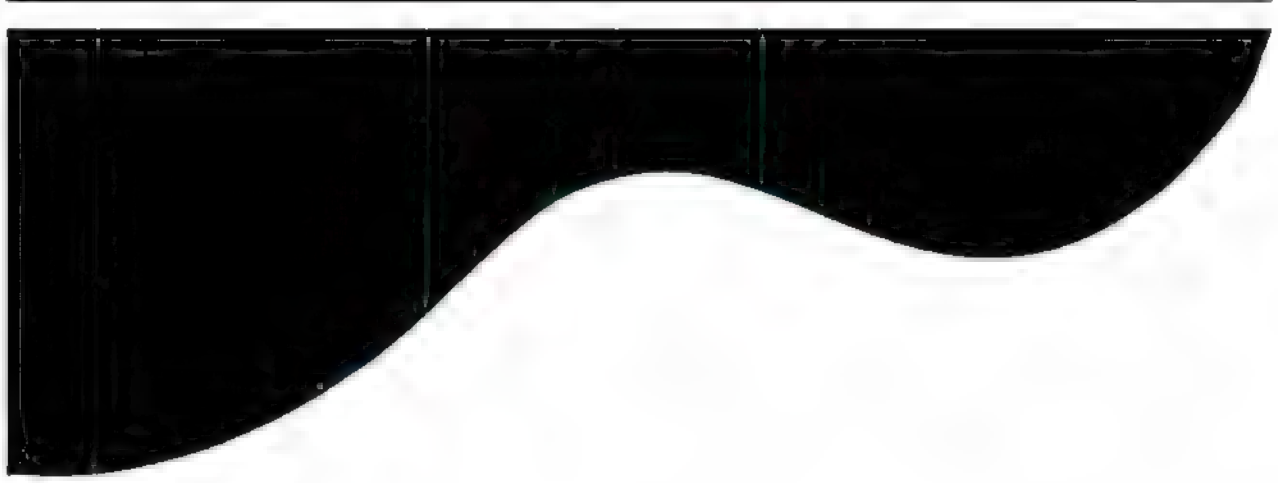

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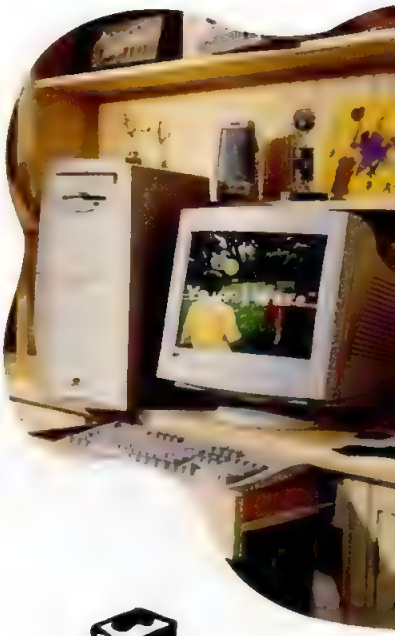

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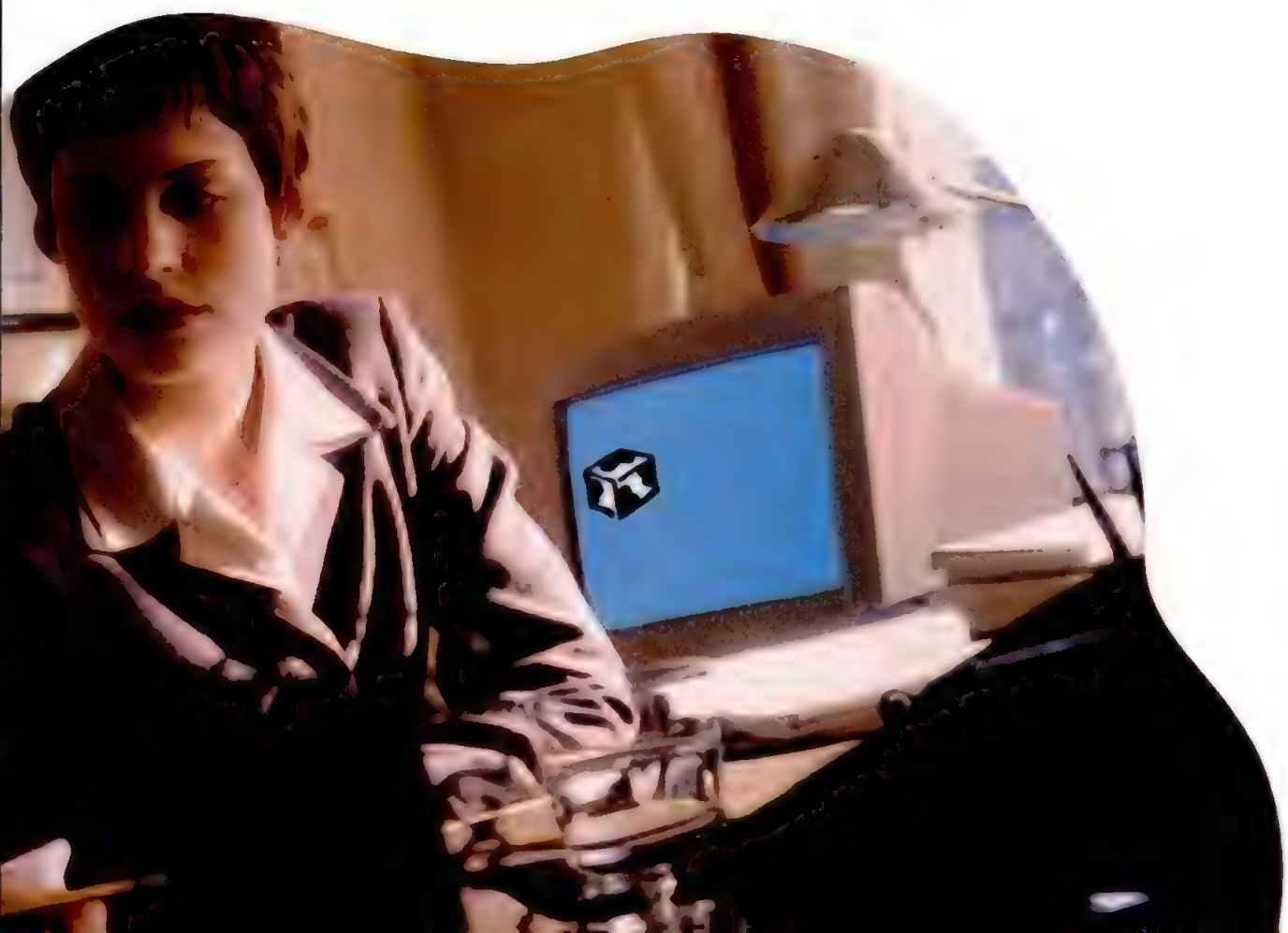

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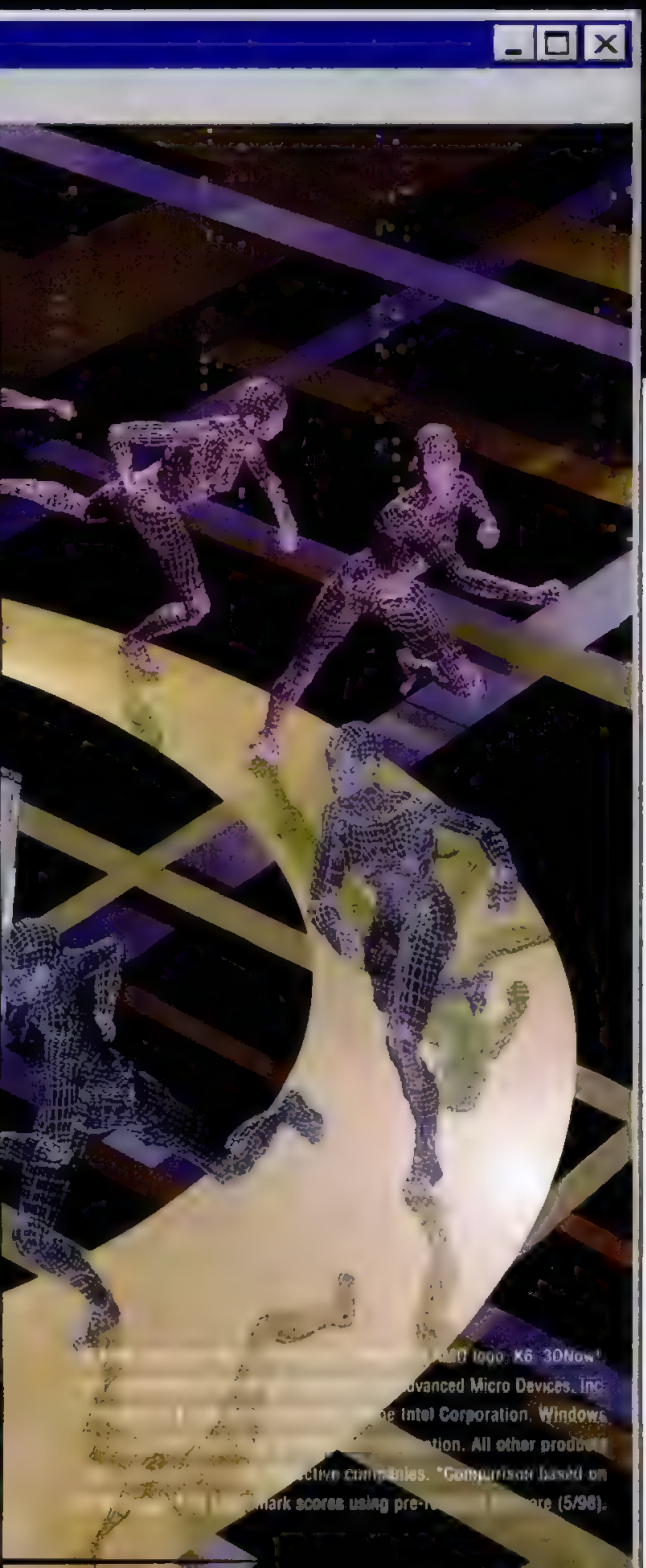

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ca. Although the unit is adept at capturing excellent images, the D-340L ($700 street) is marred by a tendency to overexpose images shot in sunlight.

The black-and-gray camera body and tripod socket are made of plastic. There's no rubberized hand grip or special niche for fingers and thumb, although the indent on the back and slightly tapered front allow the camera to be shot one-handed. The lens and optical viewfinder are protected by a sliding flap, which doubles as the camera's on/off switch. There are black frame marks, cornered crosshairs for centering the picture, and small cornered frames for shooting with the 2X digital zoom to guide you as you frame your shot.

The camera is fairly easy to set up and use. The control buttons all have icons describing the actions they represent. Pressing the star button brings up various functions, including telephoto and wide angle.

The D-340L's sequence mode fires about 2 frames, or 6 to 10 fps for 3 to 5 seconds, depending upon the size of the file and the complexity of the subject. But you can't use the flash in this mode, and the maximum shutter speed is only 1/30 second. That means the image might be too dark if shot inside. In macro mode, the flash illuminates perfectly, down to 8 inches, though you may run into a parallax problem at such close range. The tele mode is relatively easy to set—push the mode button until it appears, automatically activating the LCD. Pressing the + or - button changes the magnification.

The panorama stitch function activates the LCD and shows both the extent of the current frame and a box that tells you where to position the camera next in order to capture overlapping images.

Olympus warns not to use any other brand of SmartMedia cards in the D-340L, because they may not record properly. We tried a Fuji card in it, and it wouldn't work in panorama mode. Bundled with the unit is a SmartMedia floppy disk adapter, which normally sells for $100 (street).

Olympus D-340L

Street price: $700

Requires: 16MB RAM, 45MB hard disk space, Windows 95 or later, available serial port, CD-ROM drive

Olympus America Inc., Melville, NY; 800-622-6372

olympus.com/digital

404 at www.pcmag.com/infolink

Were it not for the tendency to brighten or overexpose images shot in available light, the D-340L's excellent lens and feature set would have boosted its score much higher. Still, given the maturity of Olympus' product line, the D-340L is a suitable choice for bargain-conscious users who want a versatile, no-nonsense camera.

Panasonic Consumer Electronics Company

Panasonic PalmCam PV-DC1580

When its auxiliary flash is detached, the Panasonic PalmCam edges out the Fujifilm MX-700 as the smallest and lightest megapixel digital camera on the market. But size isn't all that matters: Due to an inconvenient protruding lens snout that's half again as wide as the camera body, the PalmCam ($599 list) isn't flat enough to slip into a shirt pocket. And with the flash attached, it becomes the longest and most awkward camera in our roundup.

The case, which is made of gray aluminum and plastic with a wraparound rubberized grip, has a solid, precise feeling. As small as it is, the PalmCam isn't really designed for one-handed shooting. Only the shutter button can be reached by the trigger finger, and all the other controls have to be operated left-handed. Turning the camera on manually opens the lens cover. There are black frame lines in the optical viewfinder for macro subjects, but it gets confusing, as they don't specify which set is for macro1 and which is for macro2. There's no door for the CompactFlash card slot, just an eject button on the bottom. It's the only camera we tested that lacked a tripod socket.

All of the PalmCam's buttons and controls are clearly marked, though mostly with abbreviated text. A double button on the power switch makes it marginally harder to turn the camera on or off accidentally. There's a switch to the left side of the LCD for selecting macro1 (up to 10.6 inches) or macro2 (5.5 inches), but unlike other cameras, the lens does not automatically return to normal focus. If you forget to switch back to normal, all images can be shot out of focus.

Pressing the Mode button automatically turns on the LCD, and pressing it again pages through the normal, zoom, wide (panorama), multi (9 shots in 3 seconds in a single frame), and fine modes. Setting up the camera is not intuitive, since the PalmCam does not use the common LCD menu interface.

The PalmCam snaps into a cradle to allow communications with a PC, printer or television, as well as to provide AC power and recharge the removable nickel cadmium battery pack.

Shooting with the PalmCam is fast but requires some diligence to ensure that the lens is in the normal position and that the attached flash has been turned on. There is no control panel LCD, which means you have to turn on the LCD to view the mode and status lights. One notable feature is the blinking warning that indicates when you have too much or too little light for proper exposure; however, it works only when the LCD viewer is activated.

For all of the niceties of the camera's operation, the image quality is below average. This is because the contrast is artificially enhanced to increase sharpness, at the expense of color fidelity.

Panasonic PalmCam PV-DC1580

List price: $599

Requires: 16MB RAM, 10MB hard disk space, Windows 95 or later, available serial port, CD-ROM drive

Panasonic Consumer Electronics Company, Secaucus, NJ; 800-222-4213

www.panasonic.com

405 at www.pcmag.com/infolink

If you need to take your camera on the go, the PalmCam's lightweight and compact design make it a pleasure to use. But be prepared to make a trade-off between image quality and camera size. PC

VIDEO-EDITING SOFTWARE

Gone Hollywood

Adobe's new version of Premiere debuts an entirely new video-editing interface.

By Luisa Simone

Version 5.0 of Adobe Premiere ($600 street) feels more like a new product release than an upgrade to an old standard. This is due in large part to a totally new interface that's designed to mimic high-end nonlinear video systems.

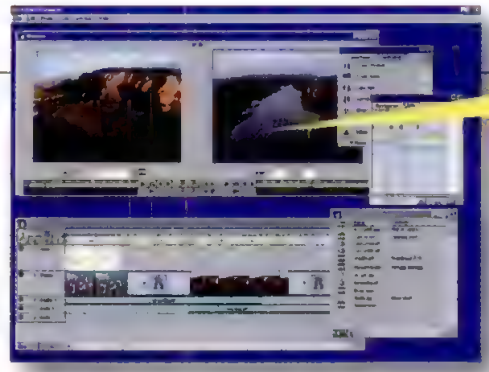
Instead of separate clip and preview windows, Premiere now offers an integrated Monitor window where source clips and the timeline program play side by side. This means you can load—and quickly switch between—multiple source clips, which may be inserted into a target track on the timeline using the three-point editing technique common to high-end software. In some cases, power-user tools replace more accessible ones. For example, Premiere relies on keyboard shortcuts rather than a handy button that plays a clip's in/out points.

The timeline now lets you collapse the A and B tracks for single-track editing or exclude tracks from the rendered movie. The Project window can display files as icons, thumbnails, or in a list format, complete with user-defined database fields, simple sorts, and Boolean searches. Premiere even boasts a Navigator window that makes it easier to maneuver and zoom the timeline.

Extensively rewritten code builds in support for Microsoft DirectShow 5.0, Apple's QuickTime 3.0, and low-bandwidth Internet codecs, such as Real Networks' Real Video Streaming format. A long-awaited fix for the dropped frame rate of 29.97 fps means that audio and video stay in sync for the duration of a long movie (which can now be up to 3 hours).

Premiere delivers only a handful of new tools and effects. Rudimentary title rolls and crawls are now automated, there are 14 additional audio filters, and you can control both audio and video filters with keyframes. Slip-and-slide editing tools let you adjust the in/out points of contiguous clips on the timeline without changing the program's duration.

Certain functions, such as a cross-dissolve transition, were noticeably slower in this version. A bug with the Intel Indeo 5.04 codec consistently produced a crash instead of a preview. Movies exported with the Indeo Interactive codec displayed glitches during transitions. Adobe is planning a maintenance release; meanwhile, downloading Indeo 5.06 will address some sync issues.



Premiere's new Monitor window shows source clips and a preview side by side.

HIGHER END: *As with high-end editors, Premiere's A/B video and transition tracks can be collapsed.*

Premiere's productivity-boosting interface is sure to appeal to professional video producers but is more difficult for dedicated Version 4.2 users to learn. In either case, we recommend waiting for the bug fixes before introducing Premiere 5.0 into a production environment.

Adobe Premiere 5.0. Street price: $600 (upgrade: $199). Requires: 32MB RAM, 60MB hard disk space, and Microsoft Windows 95 or NT 4.0 or later. Adobe Systems Inc., San Jose, CA; 888-724-4507, 408-536-6000; www.adobe.com. *406 at www.pcmag.com/infolink.*

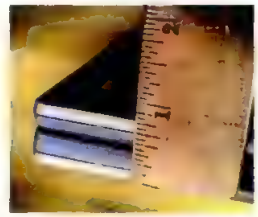
NOTEBOOK PCs

Svelte Computing

The superslim, 3-pound Sony VAIO 505GX notebook sets a new standard for portability.

By Carol Venezia

What's your idea of the perfect ultraportable? If it's a system with a 266-MHz Pentium/MMX processor, an integrated V.90-upgradable K56flex modem, fabulous sound and multimedia options—all rolled into a 3-pound chassis that measures less than an inch thick—it's not a pipe dream. It's the Sony VAIO 505GX ($2,700 street).



THIN IS IN: *The 505GX is less than an inch thick.*

Housed in a shiny silver magnesium alloy case, this notebook scores points for aesthetics. And since it measures just 10 inches wide, 8 inches deep, and weighs about 3.5 pounds (with AC adapter and primary battery), you'll hardly know you're carrying a fully functional PC.

Although the 505GX has a powerful 266-MHz processor, you may find its other core components a bit limiting if you're a serious power user. System RAM is expandable only to 64MB, the 2.1GB hard disk is not upgradable, and the 10.4-inch TFT display supports only 800-by-600 resolution. Since the unit's primary battery, a metallic cylinder that snaps on the back of the case, lasted just 1:30 on our BatteryMark test, we'd suggest you get the extended pack, which ran for 3:33.

Still, the 505GX does bring an as yet unseen feature to the world of portable computers: a FireWire port. Integrated on the left side of the machine is an i.LINK 1394 jack, a four-wire adapter that accepts powered devices. Together with the bundled DVGate software and a digital video camera, you can capture and edit video on the system.

Another interesting feature found only on the 505GX is Sony's ScribblePad application. Using the bundled software, the included stylus that pops out from the side of the unit, and the touchpad (which recognizes handwriting), you can add your signature or drawings to any document.

Sony has some great accessories available for this notebook. First is a $100 pair of half-moon-shaped stereo speakers that attach to the sides of the display panel and provide surprisingly good sound. You can also get a 14.5X, 1.2-pound PC Card-attached CD-ROM drive for $300. The base price of the 505GX includes a floppy disk drive and a port replicator, which is necessary since parallel, serial, and VGA-out ports are not built into the system.

If you want to take your show on the road without sacrificing your shoulder, the Sony VAIO 505GX may be right for you.

Sony VAIO 505GX. Street price: $2,700 with 266-MHz Pentium/MMX processor, 32MB RAM, 2.1GB hard disk, Windows 98. Sony Electronics Inc., San Jose, CA; 888-315-7669, 408-432-1600; www.sony.com/VAIOdirect. *402 at www.pcmag.com/infolink.*

PHOTOGRAPHY BY THOM O'CONNOR

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Slim, color-coordinated 14X CD-ROM drive for serious multimedia capability. Or listen to CDs with headphones.

Rechargeable battery pack (large)

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Stereo speakers

Just clip these speakers on both sides of the display panel for enhanced sound performance.

AC adapter

Just plug it into your VAIO 505 SuperSlim Notebook and forget all your concerns about battery life.

The new Sony VAIO® 505 SuperSlim Notebook.

What are you thinking?

Is it, perhaps, that nobody—not even Sony—could possibly fit everything you need into a notebook that small?

OK. Here are some of the VAIO 505's basic specifications:

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- **Under 3 pounds. Less than 1 inch thick**
- [illegible]
- **10.4" Active Matrix LCD Display**
- [illegible]
- **Windows® 98 pre-installed**

What are you thinking now?

Make no mistake. The VAIO 505 SuperSlim Notebook is everything you hope it is. It really is that slim. It really is that lightweight. It really does look that good. And, yes, it really can do everything you need it to do—every bit as capably as other notebooks at around the same price.

MMX intel inside pentium

PCG-5050X

- 266 MHz Intel® Pentium processor with MMX technology
- 10.4" Active Matrix SVGA Display (800 x 600 resolution)
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- 2.1 GB hard drive
- K56flex™ Data/Fax modem (software upgradeable)[1]
- 128-bit graphics accelerator
- Programmable power key
- Touch pad with pen operation
- i. Link™ (IEEE-1394) port for digital video capture[4]
- Price includes accessories: AC adapter, rechargeable battery, floppy disk drive, port replicator

$2,699[5]

PCG-5050

- 200 MHz Intel Pentium processor with MMX technology
- 10.4" Active Matrix SVGA Display (800 x 600 resolution)
- 32 MB SDRAM (expandable to 96 MB)
- 2.1 GB hard drive
- K56flex Data/Fax modem (software upgradeable)[1]
- 128-bit graphics accelerator
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HAND-HELD COMPUTING

Palm Co-Pilot

Palm Navigator converts any 3Com PDA to an electronic compass and map reader.

By Bruce Brown

If you're a Palm device user who likes compasses and maps, Precision Navigation's Palm Navigator 1.0 ($39.95 list) may be just what you're looking for. Palm Navigator is a hardware and software combination that enables a 3Com PDA to perform as an electronic compass and to display reference maps.

The hardware module works with all 3Com connected organizers and the IBM-branded WorkPad. Powered by two triple-A batteries, the compass uses magnetic sensor technology and has no moving parts.

The Navigator software module installs on the Palm device, operates the compass, and displays maps. Map Sync, which runs on the host PC, converts GIF or BMP map files from the Web to the PDB format used by the Navigator.

The compass must first be calibrated to compensate for the metal properties of the Palm device and its batteries. Calibration involves holding the PDA 5 feet from any metal object and slowly rotating it. The Navigator program can then issue a distortion warning when there is a significant change in the magnetic field. The compass takes sample readings 1 to 4 times per second and is rated accurate within 2 degrees.

No maps come with Palm Navigator, but they can be downloaded (from *www.mapquest.com*, for example), scanned, or created with any program that creates BMP files. Map Sync converts map files and transfers new maps to the Palm PDA during Hot Sync. To conserve memory, you can store your map library on your PC and transfer and delete files on the PDA as necessary.

The Navigator's Compass and Map modes are used when the electronic compass is operational. In Compass Mode, when you hold the Palm device in front of you, the simulated compass indicates the direction you're facing. In Map Mode, a selected map is displayed with the compass image as an overlay. The compass image can be dragged around the screen to facilitate reading the map. If the electronic compass is not connected to your Palm device, you can still run the Navigator program in Demo mode to display maps.

The Palm Navigator's sensitivity to metal doesn't make it useful in a car. But this convenient package can be a reliable hand-held navigation tool to use with or without maps.

Palm Navigator 1.0. List price: $39.95. Requires: 40K of Palm-Pilot memory plus additional memory for each map, Windows 95, 98, or NT. Precision Navigation Inc., Santa Rosa, CA; 888-422-6672, 707-566-2260; www.precisionnav.com. *415 at www.pcmag.com/infolink.*

WEB DATABASE MANAGEMENT

Web Data Basics

Drumbeat lets you create database-driven Web sites without any serious programming.

By Edward Mendelson

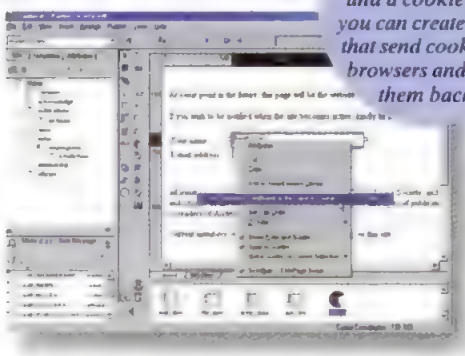
Building a Web site with database access and interactive pages used to require a suite of applications and serious expertise in HTML, databases, and JavaScript programming. Elemental Software's Drumbeat 2.0 ($699 list) lets nonprogrammers get the job done with drag-and-drop ease. This industrial-strength powerhouse suffers from some rough edges and incomplete documentation, but after you crest the initial learning curve, you can build gigantic, professional-level Web sites without writing a line of code.

Drumbeat is a development environment that shields you from HTML and JavaScript code. As you work, the program builds your site in its proprietary format and translates it into HTML or Active Server Pages (ASPs) when you publish your site to your disk or to a remote server. You create a page by dragging images from Windows Explorer and interactive items like form fields, audio files, event timers, and browser "cookies" from a toolbar.

Layout tools include pixel rulers, snap-to guides, and pop-up menus for controlling dynamic effects like images that fly onto a page. Page formatting can be controlled by underlying templates with rules, graphics, and other text that appears in all pages based on the template.

Database access is Drumbeat's strongest feature, and queries and forms are amazingly easy to build. A wizard prompts you through dialogs in which you select a database source and then build an SQL query by selecting columns from the source and then, optionally, customizing the query to limit results. Another wizard then walks you through creating a form on your page and automatically builds a table with the results of a user's query. You can modify this table's format or accept the defaults.

Drumbeat creates ASPs with embedded SQL queries. When the user requests a page, the result of the query is used to build the page on the fly that is displayed in the browser. A unique "smart spacer" feature automatically adjusts the placement of page elements so that everything will be visible even if the results of the query produce an element (like a text box) larger than you anticipated.



EZ BAKE: *By right-clicking on page elements and a cookie icon, you can create pages that send cookies to browsers and read them back.*

The ideal user for Drumbeat has moderate HTML expertise and some basic knowledge of the capabilities of JavaScript and databases. This user won't have to enter any code but will be able to figure out the undocumented features of the program, like cookie creation and retrieval. Drumbeat is an impressive product that automates more advanced Web site features than anything else on the market.

Drumbeat 2.0. List price: $669. Requires: 30MB hard disk space, 32MB RAM, Microsoft Windows 95, 98, or NT 4.0 or later. Elemental Software, Carlsbad, CA; 877-378-6232, 760-931-7171; www.drumbeat.com. *416 at www.pcmag.com/infolink.*

PHOTOGRAPHY BY THOM O'CONNOR

25 Essential Tools for Home and Business

Simply FUNctional

#12

Photo Calendars Schedule everything with four customizable calendars. Use any images - even your own pictures - to create a calendar as individual as your schedule.

#21

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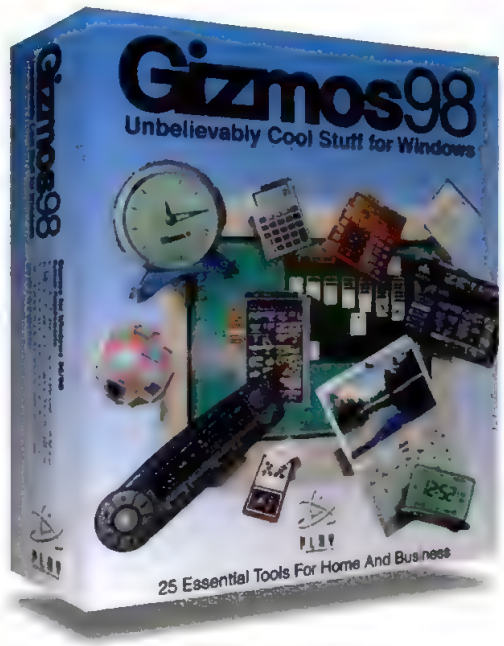

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OFFICE SUITES

Suite Talker

Voice-activated Lotus SmartSuite turns up the volume in the office applications market.

By Edward Mendelson and Craig Stinson

Lotus, unwilling to yield the office suite market to Microsoft, has strengthened its offerings with conveniences that Microsoft Office still can't match. Lotus SmartSuite Millennium Edition ($399 list; upgrade $149), targeted at the corporate market, opens and saves files on remote Internet sites more easily than rival suites, has built-in IBM ViaVoice voice recognition software, and is uniquely integrated with Lotus Notes.

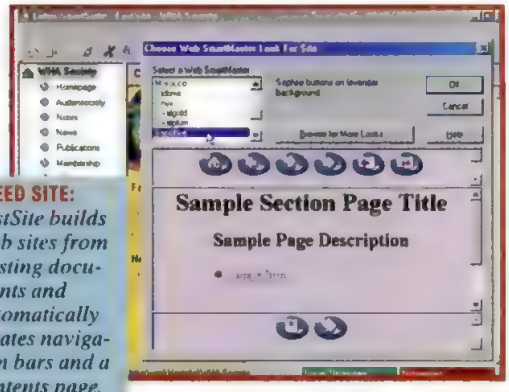
SmartSuite Millennium Edition includes a new Web site creation tool called FastSite and has the ability to save fully formatted files in Net-It Software's jDoc format for accurate display in any Java-enabled browser. Other new components are improved versions of the Word Pro word processor, 1-2-3 spreadsheet, Freelance presentation software, Organizer PIM, and Approach database. Also included is SmartCenter, a toolbar that sits at the top of your screen and does triple duty as a control center for the entire suite, a miniature PIM, and a miniature Web browser with built-in links to news, weather, and financial pages.

INTERNET INTEGRATION

Every suite vendor claims to offer Internet integration, but SmartSuite's Internet features and ease of use leave other suites in the dust. An Internet button on each of SmartSuite's File/Open and File/Save dialog boxes lets you open, save, delete, and otherwise manage files on remote FTP or Web sites, and the file-transfer code has been optimized so that remote files snap open startlingly fast.

The corresponding features in Microsoft Office and WordPerfect Suite are almost unusable, because those suites can't remember which directory to drill down to in remote FTP sites; they make you waste time typing or selecting subdirectories until you finally get to the one you want. A hyperlink dialog easily builds links to remote sites or bookmarked locations in a file.

True to its corporate roots, SmartSuite includes very strong team-versioning and mail-routing features and adds new security controls to prevent reviewers from directly modifying files. The suite's LotusScript programming and macro language are too complex for anyone but programmers, but corporate information managers may be pleased to find that users can't customize SmartSuite (except to rearrange menu items in Word Pro). Individual users may long for Microsoft Office's easy customization and WordPerfect Suite's recordable cross-application macros.



SPEED SITE: *FastSite builds Web sites from existing documents and automatically creates navigation bars and a contents page.*

WORD PRO

Word Pro still isn't as feature-rich or as automated as Word or WordPerfect, but it's generally easier to use. A unique HTML Export Assistant gives thorough control over the layout features you want to preserve when saving a file to the Web and automatically builds navigation aids.

In ordinary page editing, frames (generally invisible, and not to be confused with HTML frames) contain all the text and graphics on a page. This means words and images are more smoothly integrated than in rival suites, where graphics are tacked awkwardly onto the underlying text.

Word Pro's default menus are less cluttered than those of rival word processors, but a new option lets you use menus that mimic those of Word or WordPerfect. A menu-finder feature lets you use the standard Word Pro menu, but if you type in individual menu commands from Word or WordPerfect, the program finds the equivalent commands in Word Pro.

As in all Lotus applications, a floating Info Box is the main interface for controlling text, graphic, and page formats. Because some users found the Info Box difficult to navigate, Word Pro now has a top-line Page menu designed to give quick access to page settings. A frustrating bug makes the Page menu the only top-line menu item that can't be accessed with a shortcut key. Another glitch prevents you from deleting an envelope from a document without going through a long series of commands.

The ViaVoice voice recognition software can be turned on from a top-line Dictation menu and optionally appears as a taskbar across the top of the screen, at the top of the Word Pro window, or as an icon in the taskbar tray. On informal tests, ViaVoice was harder to train and less accurate than WordPerfect's version of Dragon NaturallySpeaking. But Word Pro can read back text, whereas WordPerfect can't unless you order a $49.95 (list) upgrade.

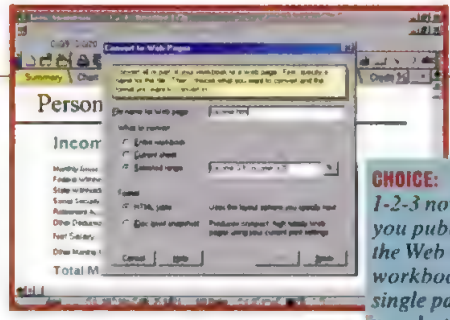
A Word from WordPerfect

Aside from a few bug fixes and minor enhancements (freely available from Corel's Web site), Corel WordPerfect Suite 8 adds nothing but Dragon's NaturallySpeaking voice recognition. As it does with Lotus, voice recognition feels more like an add-on than an integrated feature. You can use it to input text, but you won't find any voice shortcuts to special formatting, mailmerge, or other commands. Fixed bugs and minor enhancements include smoother import and export of Word 97 documents.

Corel sells standard and professional versions of WordPerfect Suite 8, but only the standard version now comes with voice recognition. Existing users of either version can, however, order a $49 upgrade disk that adds the voice recognition version of the word processor and all bug fixes. Version 9, available early next year, should add voice recognition to Quattro Pro.

Corel WordPerfect Suite 8 with Dragon NaturallySpeaking. List price: $425 (upgrade, $129). Corel Corp., Ottawa, Ontario; 800-772-6735, 613-728-8200; www.corel.com. *408 at www.pcmag.com/infolink.*

The latest Word Pro is worth having for its ease of use and workgroup-revision features, even if it can't compete with Word's automated formatting and WordPerfect's depth of features.



CHOICE: *1-2-3 now lets you publish to the Web entire workbooks, single pages, or selected ranges.*

1-2-3

Voice integration, the most attention-grabbing new feature in 1-2-3, isn't here yet. With a ViaVoice-aware SmartMaster template, you'll be able to talk to your spreadsheet. On an expense report template, for example, if you say "fourteen dollars for breakfast on Tuesday," the number will appear in the appropriate cell. You'll also be able to use ViaVoice for proofreading, letting the software read your spreadsheet back to you so you can compare it to off-line sources.

Although Lotus intends to ship a bunch of these intelligent templates later this summer, we weren't able to test any for this review. Early buyers of the Millennium Edition can download the templates from the company's Web site when they become available.

Web publishing is improved in the newest 1-2-3. You can now publish an entire workbook, the current page, or the current range, and you can choose between publishing an HTML table or a snapshot of the selected region. The last option uses Page Setup settings and exports a replica of what you get from your printer. Other new Internet features include the ability to implant hyperlinks on the worksheet and a simple means to forge updatable links between worksheet cells and on-line data sources.

A handful of new conveniences adorn the 1-2-3 worksheet. An enhanced fill-by-example feature makes it easier to create standard label sequences. If you type Monday in one cell, and the letter *W* in the next, 1-2-3 will offer to turn *W* into *Wednesday*. The program recognizes all the common date patterns and lets you create your own label sequences as well.

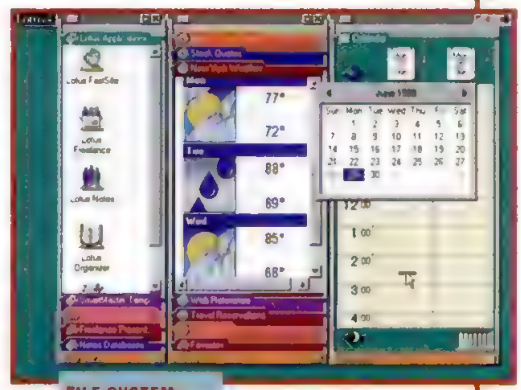
In the last version, if you typed *Total* to the left of and below a range of numeric columns, the program would create the appropriate @SUM formulas automatically. The Millennium Edition expands this idea, accommodating all the standard statistical functions and lets you define your own. (The @Count function didn't work on our tests, but the other statistical functions did.)

An expanded function library now includes binary and octal conversion functions, conditional summing and counting functions, 18 new financial and 19 new statistical functions, and a few other useful items. The print preview allows interactive margin changes; and those addicted to massive worksheet can now get 65,535 records on a page.

The latest enhancements to 1-2-3 put the program on a par with Excel and ahead of Quattro Pro in the area of Internet connectivity. Assuming the speech-savvy SmartMasters arrive before Corel gets NaturallySpeaking integrated with Quattro Pro, 1-2-3 will stand alone temporarily, in accepting voice input. In a few other areas, such as list management, crosstab analysis, and worksheet auditing, however, 1-2-3 remains a pace behind market-leading Excel.

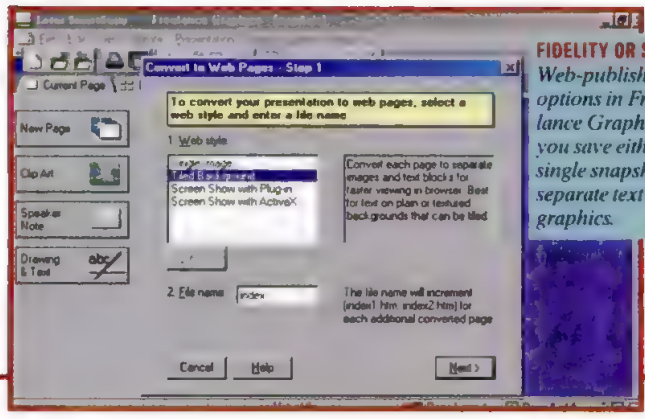
FASTSITE, FREELANCE, AND OTHERS

The ingenious FastSite Web site builder isn't a traditional HTML editor but a tool for converting existing documents into a linked set of Web pages. You choose a template, then select documents created by any standard Windows word processor, spreadsheet, or HTML editor. FastSite converts them into HTML or the Java-based jDoc format, adds a navigation frame to the top of each page, and builds a home page with a table of contents. You can then upload the whole site to a Web server using SmartSuite's Internet dialogs.



FILE SYSTEM: *SmartCenter displays Web sites and lists of programs and documents as drawers and folders.*

Freelance Graphics is notable for its new Web-publishing flexibility. Users can optimize presentations for fidelity or fast downloads. The conversion wizard lets you choose between saving each page as a single image (for fidelity) or saving each page's images and text blocks as separate units (for speed).



FIDELITY OR SPEED: *Web-publishing options in Freelance Graphics let you save either a single snapshot or separate text and graphics.*

You can convert presentations for use with a Lotus plug-in or an ActiveX component, either of which allows for page transitions, bullet builds, and animations. Other improvements include an enhanced Save and Go feature (which simplifies the use of presentations by audiences without Freelance) and a button that lets presenters view speaker notes alongside presentation slides.

The Approach database is unchanged except for interface enhancements like an Action Bar (with the most common database controls) and easier saving and opening to Notes databases. Organizer adds group calendaring and scheduling for Notes.

SmartSuite lacks the automated wizardry of Microsoft Office and the industrial-strength features in Corel WordPerfect Suite. But information managers who have lost patience with Office's susceptibility to macro viruses and other security issues and who have the complex job of maintaining it may want to consider a switch to SmartSuite, but most individual users won't be tempted.

Lotus SmartSuite, Millennium Edition. List price: $399 (upgrade, $149). Requires: 8MB RAM (16MB for NT), 29-247MB hard disk space; Microsoft Windows 95, 98, or NT 4.0. Lotus Development Corp., Cambridge, MA, 800-343-5414, 617-577-8500; www.lotus.com. *407 at www.pcmag.com/infolink.*

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Monitor	GS771	PS790
Screen Size/ Viewable	17" (16.0" viewable)	19" (18.0" viewable)
Dot Pitch	.27	.25
Maximum Resolution	1,280 x 1,024	1,600 x 1,280
Recommended Resolution	1,024 x 768 @ 87Hz	1,600 x 1,200 @ 76Hz

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INK JET PRINTERS

Color Enlargements

Epson's Stylus Photo EX brings 1,440-by-720 dpi—and 11-by-14-inch output—to photo printing.

By Bruce Brown

The new Epson Stylus Photo EX ($500 street) underscores the advances being made in ink jet printing. Though you won't want to use this printer for high-volume conventional printing—unless you want to wait almost a minute per page—there's not much else this printer isn't suitable for. Optimized for photo printing, the Photo EX boasts wide-format, 1,440-by-720–dpi, six-color printing.

The story behind the Photo EX, other than output size, is photo print quality. You can print photographic images on plain paper with surprisingly good results. The Epson printer driver lets you choose Speed (180 dpi), Normal (360 dpi), or Quality (720 dpi) mode with plain paper. If you choose Quality mode, you'll wait 10 minutes or more for full-page output, but the results are worth it.

Epson uses its Micro Piezo print head with Super Micro Dot technology, Multi-Layer Dot technology, and AcuPhoto halftoning. These technologies add up to a combination of small, precise dots of ink that overlap to produce impressively continuous-looking output.

The ink delivery system on the Photo EX consists of two cartridges: a 32-nozzle black cartridge and a five-color cartridge, with 32 nozzles per color. Because the printer doesn't rely on process colors for blacks, conventional text printing looks as good as that from mainstream high-quality ink jet printers, and it doesn't waste expensive inks. There are no special photo inks for the Photo EX; all printing is done with the same two cartridges.

Even with inexpensive paper, the Photo EX does a very good job. When you upgrade to coated ink-jet stock, the colors get richer, and using glossy photo paper and glossy photo film takes the quality up even higher. Epson now also sells thick photo paper for photo output that feels like conventional film prints.

Epson's software bundle includes Adobe PhotoShop LE 4.0; Extensis Portfolio, for organizing images, PictureWorks Spin Panorama image stitching software; and Epson Photo Sheet, which lets you print digital images in standard photograph sizes. Epson PhotoPC 600 and 700 digital camera owners can attach them directly to the printer (via a $69 cable and software option), to print without connecting either device to a PC.

By combining large-format printing, impressive photo-image print quality, and an array of photo paper selections, the Photo EX is an appealing choice for digital photography enthusiasts.

Epson Stylus Photo EX. Street price: $500. Requires: 16MB RAM, 50MB hard disk space, Microsoft Windows 3.1*x* or later or NT 4.0. Epson America Inc., Torrance, CA; 800-463-7766, 310-782-0770; www.epson.com. *411 at www.pcmag.com/infolink.*

OUTPUT: *Photos printed on plain paper with the Photo EX look surprisingly good.*

PHOTOGRAPHY BY THOM O'CONNOR

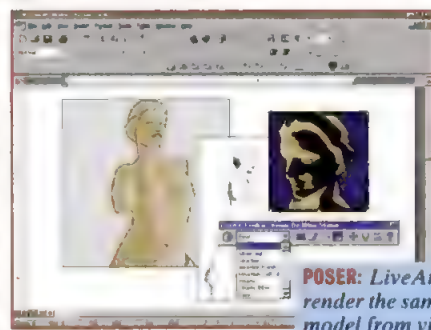
GRAPHICS SOFTWARE

Customizable Clip Art

LiveArt 98 supplies 4,000 pieces of 3-D clip art you can customize and insert right into Word and PowerPoint.

By Luisa Simone

Desktop publishers have a love/hate relationship with clip art. Too often, the perfect picture turns out to be drawn in the wrong perspective or the wrong style. LiveArt 98 ($100 street) changes the very nature of clip art by providing a searchable catalog of an impressive 4,000 3-D models.



POSER: *LiveArt lets you render the same 3-D model from virtually any perspective, with one of 35 different illustration styles.*

You create the right perspective by sizing, moving, and rotating the model in true *x*, *y*, *z* space. The magic happens when you select one of 35 rendering modes that simulate drawing and painting techniques, such as fresco or watercolor. Changing viewpoints and styles lets you generate a multitude of illustrations from a single 3-D model. You can also apply the same LiveStyle to a range of models to create a stylistically cohesive group of images.

LiveArt's limited tool set and streamlined interface make it easy to learn. But don't expect a full-featured 3-D modeling program. Modifications, for example, are limited to changing the direction for a single light source and choosing a new color.

LiveArt is meant to be used as an OLE 2.0 server. Users can access its power while remaining in a familiar environment, such as Microsoft Office.

As an OLE application, LiveArt renders all images at the current screen resolution. This is acceptable for desktop printouts and screen presentations but is problematic for Web delivery and unsuitable for high-resolution printed output. As a potential solution, Viewpoint includes a version of LiveArt called Sketchpad, but our testing revealed that Sketchpad lacks useful export options—all images were generated at 72 dpi. We couldn't save LZW-compressed TIF files nor could we specify transparency or a Web-safe palette for PNG files (the Web format Sketchpad uses).

LiveArt requires 3-D acceleration and will install OpenGL or DirectX drivers to your system, if necessary. But unless you're blessed with a powerful 3-D chip set for which LiveArt has been optimized, you can expect performance to slow when working with complex models or processor-intensive rendering modes.

Due to Sketchpad's export problems, we can't recommend LiveArt for high-end graphics. Office 97 users, however, will find LiveArt to be an easy way to create customized clip art and a rationale for upgrading to a new 3-D graphics board.

LiveArt 98. Street price: $100. Requires: 32MB RAM, 40MB hard disk space, Microsoft Windows 95, 98, or NT 4.0 or later. Viewpoint DataLabs Inc., Orem, UT; 888-535-6468, 801-229-3204; www.viewpoint.com. *412 at www.pcmag.com/infolink.*

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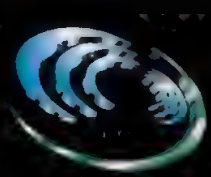

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NETWORK LASER PRINTERS

New on the Network

Hewlett-Packard replaces the old standby 5si departmental laser printer with the new LaserJet 8000 DN.

By Les Freed

Not too long ago, Hewlett-Packard had the departmental laser printer market all to itself. But recently, new products from competitors—including copier giant Xerox—have shaken up the status quo. The HP LaserJet 8000 DN ($3,180 street) replaces and improves on the company's highly successful LaserJet 5si departmental laser printer, adding new features to make it more competitive.

Like the 5si before it, the 8000 DN is a heavy-duty, 24-page-per-minute workhorse, designed to serve up over 130,000 pages per month. The 8000 DN is one of three models in the 8000 range, adding two-sided printing and a Fast Ethernet network interface to the $2,350 base model 8000.

NEW AND IMPROVED

The LaserJet 8000 DN improves on the older 5si in several key areas. Although both are rated at 24 pages per minute (ppm), the 8000 DN's faster RISC processor (133 MHz versus the 5si's 40 MHz), increased standard RAM (from 4MB to 24MB), and enhanced I/O capabilities lets the 8000 DN print complex pages faster than the 5si. Two 100-pin SIMM sockets provide room for memory expansion up to 192MB.

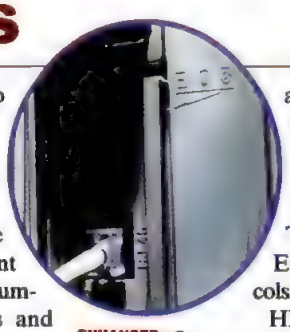
HP claims an effective resolution of 1,200 dpi using the company's FastRes 1200 resolution enhancement technology. All three LaserJet 8000 models operate in PCL 5e, PCL 6, and PostScript modes, and all include 80 built-in TrueType fonts.

Our test LaserJet 8000 DN performed flawlessly and with excellent speed, producing crisp, clear text and very sharp graphics with good toner coverage. Our standard 50-page test document printed at 20 ppm single-sided and an impressive 16.7 ppm double-sided.

Like the similarly priced Xerox DocuPrint N32 and the much more expensive LaserJet 5si Mopier, the LaserJet 8000 DN can print multiple copies (*mopies*, in HP jargon) of a single document by storing the page's print image in RAM. This ability, combined with a per-page cost comparable to a photocopier, makes it practical to print multiple-copy documents on the LaserJet 8000 DN.

PAPER OPTIONS

Of course, printing more pages on your printer means you'll need more paper, toner, and more room for your output pages. The LaserJet 8000 DN comes with two 500-sheet paper input trays, and the lower tray accepts paper up to 11 by 17 inches. A side input tray accepts paper or envelopes of just about any size; we found it a convenient way to feed small numbers of envelopes and odd-size papers. Separate top and side output trays let you stack jobs faceup or facedown, and each one holds about 100 sheets.



ENHANCED: *One of the HP's 3 new 32-bit EIO expansion slots.*

HP offers a variety of paper input and output options for the LaserJet 8000 DN, including an additional two-tray 500-sheet feeder, a 2,000-sheet paper drawer, two different mailbox sorter/staplers, and an automatic envelope feeder. The 8000 DN's toner cartridge is rated at 15,000 sheets and can be changed quickly and easily.

ON THE NETWORK

All LaserJet 8000 printers have one IEEE 1284 parallel interface and three of HP's new EIO (Enhanced Input/Output) expansion slots. The 32-bit PCI-based EIO architecture replaces the older 16-bit MIO slots found on previous HP printers. The 8000 DN comes with an HP JetDirect 600N internal print server installed in one of the EIO slots, and you can install up to three 600N servers in a single printer. The 600N server's built-in Ethernet interface automatically switches between 10- and 100-Mbps operation, and the server supports IPX/SPX, DLC/LLC, TCP/IP, and EtherTalk protocols.

SIDEWAYS: *The HP LaserJet 8000 DN's side input tray accepts almost any size paper.*

HP ships the 8000 DN with a CD-ROM full of client and server software support, including NetWare 3.*x* and 4.*x*, Windows NT 3.51 and 4.0, Windows 3.1, 95, and 98, OS/2 Warp and Warp Server, and AppleTalk.

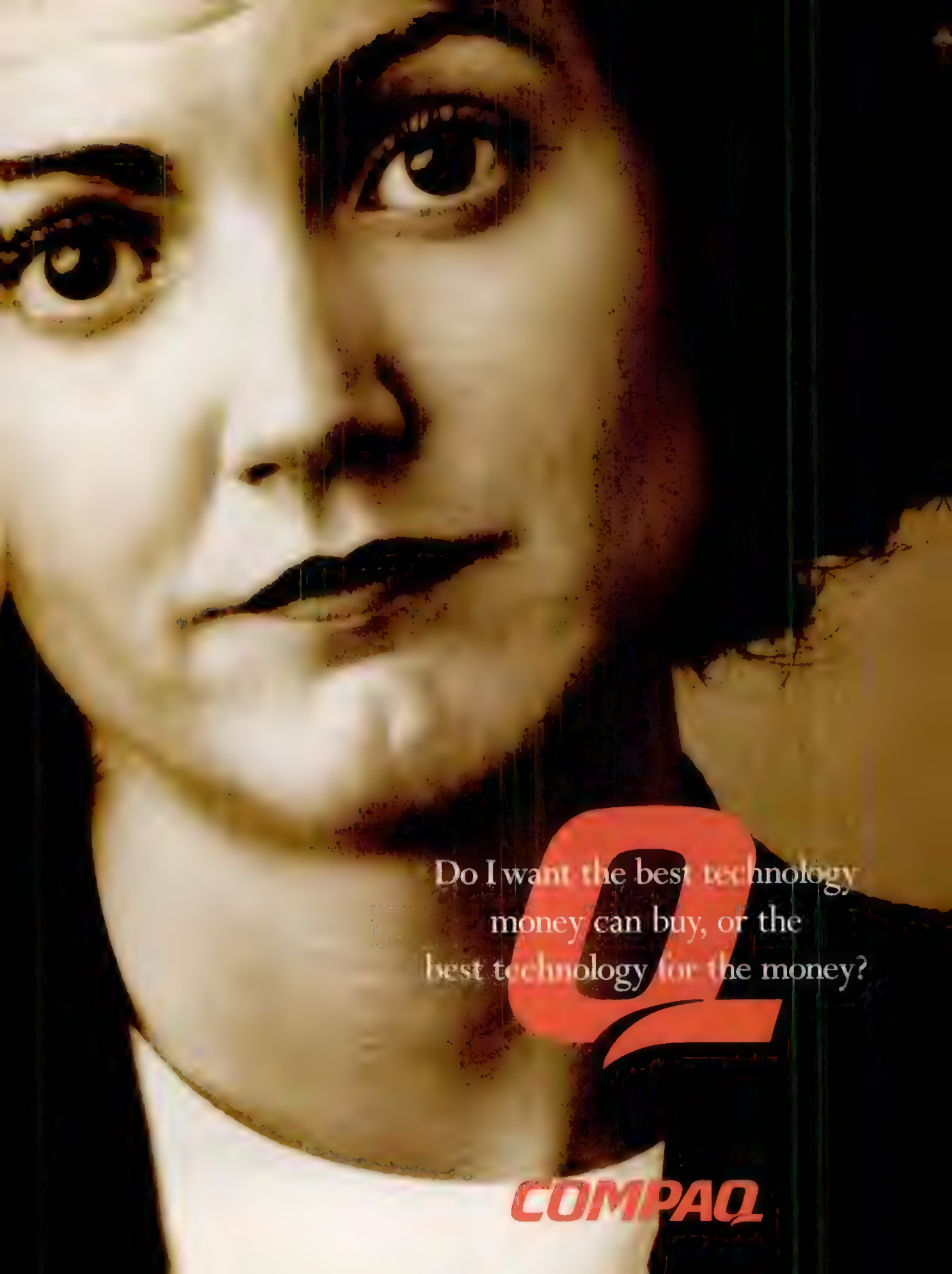
HP's printer driver for Windows 95 and NT provides easy access to all of the 8000 DN's paper-handling features. The driver adds several new features, including *n*-up thumbnail printing (up to 16 pages per sheet), booklet printing, watermarking, and HP's ZoomSmart auto-resizing feature. An Internet Install feature ensures you have the latest drivers and automatically downloads new ones from HP's Web site if necessary.

Like all of HP's newer printers, the LaserJet 8000 DN comes with HP's familiar JetAdmin and the newer Web JetAdmin Web-based printer administration tools. Web JetAdmin provides a point-and-click graphical interface accessible from any Web browser on the LAN. Web JetAdmin provides real-time monitoring, diagnostics and printer management for any MIB-enabled printer on the LAN, regardless of printer vendor or OS platform.

If you're in the market for a high-powered network printer that's ready for your Fast Ethernet LAN, the HP LaserJet 8000 DN just may fill the bill.

HP LaserJet 8000 DN. Street price: $3,180. Hewlett-Packard Co., Palo Alto, CA; 800-852-0900; www.lj8000hp.com. *413 at www.pcmag.com/infolink.*

PHOTOGRAPHY BY THOM O'CONNOR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Armada 1700

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- Mobile Intel Pentium II Processor @ 233 MHz; 512 KB L2 Cache
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- 12.1" CTFT SVGA display
- 24X Max CD-ROM[4]; K56flex modem[5]
- Integrated AC Adapter
- New Multibay design allows for easy swapping of options including a second hard drive, second battery, SuperDisk LS-120, or Zip Drive
- 3-spindle design allows simultaneous access to multiple storage devices
- Optimized for use in a networked environment
- Intelligent Manageability features offer lower total cost of ownership
- Certified for multiple operating systems, including Windows NT® 4.0
- 1-year limited warranty[6]

Options for Armada 1700 Notebook

- Compaq Value Carrying Case: $49[1]
- Additional Li-Ion battery: $189[1]

Compaq Armada Notebooks

Armada 1505

The fully integrated notebook with everything you need in one convenient package.

$1,599[1]

- Intel Pentium Processor with MMX™ Technology @ 200 MHz; 512 KB L2 Cache
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- 1-year limited warranty[6]

Armada 7800

The ultimate high-performance notebook delivering unprecedented desktop functionality and mobile convenience.

$5,549[1]

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- Multibay design allows for easy swapping of options including a second hard drive, second battery, SuperDisk LS-120, or future DVD drive
- 3-year limited warranty[6]

Options for Armada 7000 Notebooks

- ArmadaStation Expansion Base for full desktop functionality: $779[1]
- ArmadaStation Tower Stand: $99[1]
- Compaq Briefcase: $99[1]

Common features of Armada Series

- Optimized for use in a networked environment
- Intelligent Manageability features offer lower total cost of ownership
- Certified for multiple operating systems, including Windows NT 4.0

intel inside
pentium II

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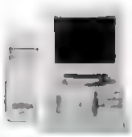

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Small Business Deskpro Solutions

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$1,459[1]

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- 2.1 GB SMART II Ultra ATA Hard Drive[2]
- 32 MB SDRAM
- ATI RAGE IIC AGP Graphics
- 24X Max CD-ROM[4]; K56flex modem[5]
- Microsoft Word 97
- Compaq Microsoft IntelliMouse™
- Compaq V75 17" (16" viewable) monitor
- 3-year limited warranty[6]

Model 6300/4300/CDSM

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- Intel Pentium II Processor @ 300 MHz
- 4.3 GB SMART II Ultra ATA Hard Drive[2]
- 32 MB SDRAM
- ATI RAGE IIC AGP Graphics
- 24X Max CD-ROM[4]; K56flex modem[5]
- Microsoft Office 97 Small Business Edition
- Compaq Microsoft IntelliMouse
- Compaq V75 17" (16" viewable) monitor
- 3-year limited warranty[6]

Options for Deskpro EP Series

- Additional 32 MB SDRAM Memory: $139[1]
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Armada SB Notebook

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- 20X Max CD-ROM[4]; K56flex modem[5]
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- 3-spindle design allows simultaneous access to multiple storage devices
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- 1-year limited warranty[6]

Options for Deskpro EP Series

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Small Business Server Solution

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- Towerable chassis converts from desktop to minitower
- 3-year limited warranty[6]

Model 6333/3200/CDS

$1,929[1]

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- 32 MB SDRAM
- ATI RAGE IIC AGP Graphics
- 24X Max CD-ROM[4]
- Compaq V75 17" (16" viewable) monitor
- Towerable chassis converts from desktop to minitower
- 3-year limited warranty[6]

Model 6350X/6400/CDS

$2,139[1]

- Intel Pentium II Processor @ 350 MHz
- 6.4 GB SMART II Ultra ATA Hard Drive[2]
- 64 MB SDRAM
- ATI RAGE PRO TURBO AGP Graphics
- 24X Max CD-ROM[4]
- Compaq V75 17" (16" viewable) monitor
- Towerable chassis converts from desktop to minitower
- 3-year limited warranty[6]

Model 6400X/6400/CDS

$2,269[1]

- Intel Pentium II Processor @ 400 MHz
- 6.4 GB SMART II Ultra ATA Hard Drive[2]
- 64 MB SDRAM
- ATI RAGE PRO TURBO AGP Graphics
- 24X Max CD-ROM[4]
- Compaq V75 17" (16" viewable) monitor
- Towerable chassis converts from desktop to minitower
- 3-year limited warranty[6]

Deskpro EP 6266X/2100

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- 16 MB SDRAM
- ATI RAGE IIC AGP Graphics
- Compaq V75 17" (16" viewable) monitor
- Towerable chassis converts from desktop to minitower
- 3-year limited warranty[6]

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DESKTOP PUBLISHING

Improving a Classic

The latest version of Ventura has a better interface plus a customizable workspace.

By Luisa Simone

Small changes in Corel Ventura 8 ($695 list) have made a big impact on this classic DTP program. The interface is more accessible and the program's operation more consistent than ever before.

Like its sibling program, CorelDraw 8, Ventura now has a customizable workspace and dockable palettes for key functions—specifically the Tag and Navigator windows. The Tag window adds a Page tag to the Paragraph, Character, Rule, and Frame tags so familiar to Ventura users. Even more important, all tags work in the same straightforward manner.

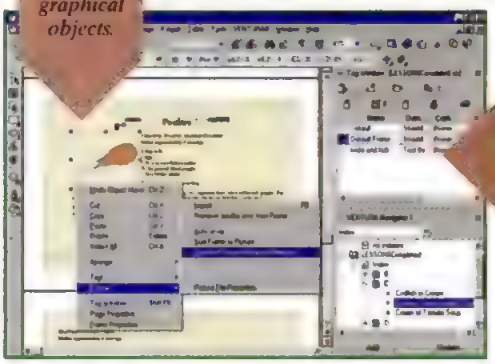
Instead of dealing with two formatting modes, Ventura 8 always assigns a default tag to an object and then lets you assign a new tag, modify an existing tag, or change the formatting on a local basis while maintaining the original tag association. This makes Ventura much easier to learn and use.

Some other productivity boosts include the ability to edit tags in the Tag window, drag tags between two open documents, and use a host of right-mouse-button shortcuts. Ventura 8 also has enhanced internal graphics functions. You can apply any Photoshop-compatible plug-in filter to an imported bitmap.

The ability to convert an imported vector picture to Ventura's native graphical-object format or to convert a graphical object to Bezier curves gives you editing freedom. You can even export drawings to standard vector formats for use in other programs.

Ventura 8 can convert your imported vector artwork to editable graphical objects.

Ventura's ability to generate Cascading Style Sheets and HTML frames will please Web publishers. In addition to URLs, Ventura now supports FTP and mailto hyperlinks.



Dockable palettes for tags and the Navigator give you control over content and appearance.

Complex graphics now print very quickly, since Ventura 8 uses the same print engine as CorelDraw 8. Ventura 8, however, doesn't correctly rasterize the EPS clipping path (and the transparent background it should create) for screen display.

Ventura 8 also does a better (but not perfect) job importing Word and RTF files. For example, Ventura converts each style in a Word document to a discrete tag (letting you reformat the document globally) but discards the actual formatting and assigns the default font and point size to all text.

This release of Ventura is the equivalent of a tune-up for your car. It's the same engine, but it runs more smoothly and works more efficiently.

Corel Ventura 8. List price: $695 ($99 for upgrade). Requires: 16MB RAM, 75MB hard disk space, Microsoft Windows 95 or NT 4.0 or later. Corel Corp., Ontario, Canada; 800-772-6735, 613-728-0826; www.corel.com. *408 at www.pcmag.com/infolink.*

HTML EDITORS

Home Free

Homestead's free Java-based WYSIWYG editor makes building your Web site a snap.

By Jim Lynch

In the beginning there was HTML. Then came HTML editing, first by hand, then through the use of WYSIWYG editors. Now there's Homestead, a free Java-based WYSIWYG tool that makes building Web sites about as easy as it can get.

You can easily add animation or graphics to your Web site by using Homestead's drag-and-drop editor.

Because it's completely Java-based, Homestead eliminates software updates. Each time you log on to the site, Homestead makes sure you have the most recent version. If you don't, it will automatically download that version to your browser.

Since everything you need is hosted on Homestead's servers, collaborating on a site is as easy as dialing your ISP and firing up your browser. You don't need to be in the same place to build a site with others. You can even password-protect a page to restrict viewing or editing.

Homestead's page editor took a minute or two to download over our 28.8-Kbps modem connection. Using the editor, positioning elements such as images or animations involves simply dragging and dropping them wherever you want them to appear. You can even add a chat room or scrolling banner.

Homestead comes with a good selection of clip art and animations, so it's easy to jazz up your site. But if you prefer, you can import an image of your own and add it to your site. We particularly liked the ability to resize graphics dynamically by manipulating the size of the graphic's box.

You can also add buttons, dividers, and borders. If you've ever wanted to play around with these page elements without bothering to create them yourself, you'll love the way they're set up in Homestead.

Homestead's editor is easier to use than the editors at GeoCities or Tripod, two of Homestead's competitors. Those two services, however, offer larger storage space as part of their memberships (11MB to Homestead's 5MB).

Those who prefer to code their own HTML should stick with GeoCities or Tripod, since Homestead doesn't allow direct editing of HTML in pages. Anyone wanting to avoid HTML coding or having to install a separate program should give Homestead a trial run. Building Web pages just doesn't get much easier—or more fun.

Homestead. Street price: Free. Requires: 28.8 Kbps or better Internet connection, Netscape 3.0 or above or IE 4.0. Homestead Technologies, Menlo Park, CA; 650-306-0670. www.homestead.com. *414 on www.pcmag.com/infolink.*

THE

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PAGE.

[CERTIFICATION]

MICROSOFT® CERTIFIED SYSTEMS ENGINEER

TRAINING GUIDE, IIS 4

by Emmett Dulaney, MCSE

This is the only book currently available on this version of the IIS 4 exam. A top squad of MCSEs outline and detail your objectives and follow them with a series of questions. At the close of the book are questions in the exact format of the MCSE exam itself. Finish that, and it's all aces. (New Riders)

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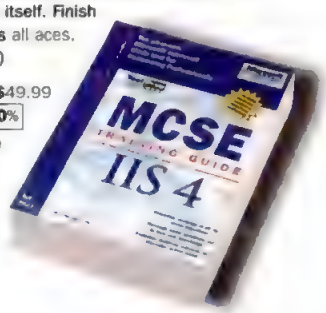

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by Jason Couchman

Become a certified professional in Oracle, the industry standard database. Whether you are a newcomer or an old-hand at database administration, this guide will expand your know-how, and help you increase security, efficiency, and dependability on all your databases. (Oracle Press)

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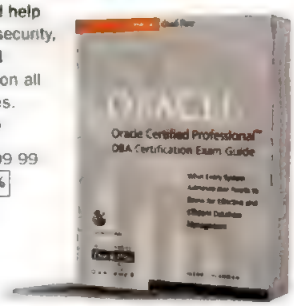

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by Joe Casad, Brian Komar, Jay Adamson, et al.

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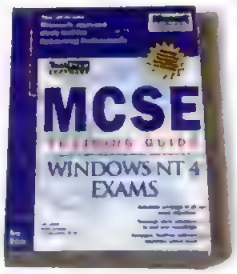

Sharpen your skills

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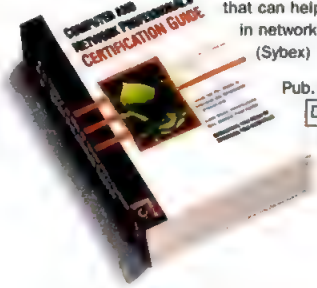

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by Jason Sirockman

Why waste time with a plethora of titles? *Microsoft Certified Systems Engineer Complete, Version 1.1* is what it says—complete. Seven courses in one package and a CD-ROM filled with practice exams offer you the most for your time and your money. (Que)

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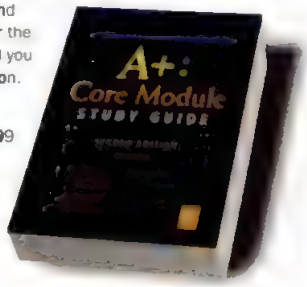
A+: CORE MODULE
STUDY GUIDE, SECOND EDITION

by David Groth

Get A+ certification with the second edition of this bestselling study guide. A CD-ROM packed with resources and "battle plans" for the exams will speed you toward certification. (Sybex)



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by Emmett Dulaney, Sherwood Lawrence, Rob Scrimger, Anthony Tilke, John White, Raymond Williams, and Kevin Wolford

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by Ed Tittel, Kurt Hudson, James Stewart, and Richard Burke

The two books and accompanying CD-ROM in this Prep and Cram Pack are essential if you want to pass the TCP/IP exam. Sample test questions and detailed coverage of exam objectives will have you in top testing shape in a manner that's both time- and cost-effective. (Coriolis)

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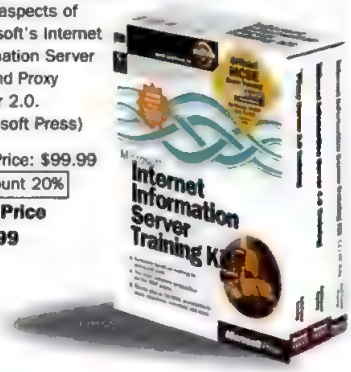

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by Michael McKelvy

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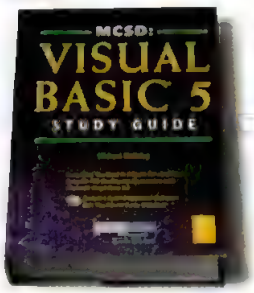

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ACCOUNTING SOFTWARE

Peachtree Branches Out

Peachtree Office Accounting is an important first step in a new approach to integration.

By Kathy Yakal

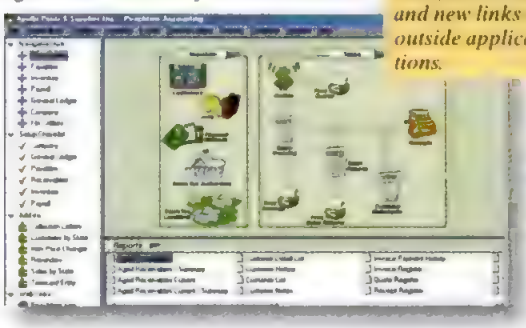
Taking a step back to take two steps forward can be risky in the software business. But Peachtree Software's done just that—with good results. Peachtree Office Accounting ($149 list) marries what Peachtree does best (low-end accounting) with Microsoft Office applications.

Office Accounting is a credible accounting package in its own right. It complies with standard double-entry accounting rules and provides an electronic framework for the bookkeeping elements most small businesses need: General Ledger, Accounts Receivable and Payable, Inventory, and Payroll.

Several tools make setup and maintenance easy, even for novices. These include a setup Wizard and customizable dialog boxes for entering records, a flow chart–style navigational aid, and an option to hide behind-the-scenes calculations and transactions. Office Accounting still maintains a lot of the sophistication and customizability of other Peachtree products, but it (intentionally) lacks some depth. For example, there's just one inventory costing method.

What makes Office Accounting important is how it shares information with outside applications. Office Accounting's open architecture lets third-party developers build add-in applications that grab Peachtree data.

Six of these EZ Add-Ins are included. One finds invoices within specific aging periods and generates collection letters in Word. Two others build maps in Excel of customers by state and sales by state. Another lets you make across-the-board price changes by dollar amount or percentage or change individual prices—all in Excel. The last sends reminders (for overdue invoices, for example) to Outlook 97. There are more add-ins to come; some will be free, others for sale.



OFFICE MATE: *Peachtree Office Accounting offers clear navigational aids and new links to outside applications.*

This new integration comes at a price: The program runs sluggishly, as does interaction with the add-ins. And some of the early add-ins lack maturity. But accounting software is a natural for innovative, secure integration with other applications. Peachtree Office Accounting is an impressive first step.

Peachtree Office Accounting. List price: $149. Requires: 16MB RAM, 65MB hard disk space (100MB if Microsoft Internet Explorer is not already installed), Microsoft Windows 95, 98, or NT 4.0 or higher. Peachtree Software, Norcross, GA; 800-428-6957, 770-724-4000; www.peachtree.com. *409 at www.pcmag.com/infolink.*

WEB COLLABORATION

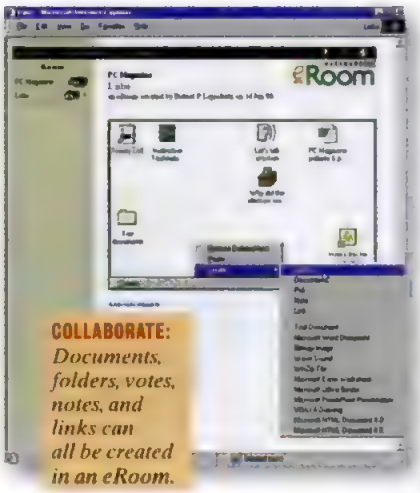
A Room for Your Views

Make Microsoft's Web server work for your workgroup with Instinctive Technology's eRoom.

By Robert P. Lipschutz

Instinctive Technology's eRoom transforms Microsoft's Web server into an easy-to-use document-sharing solution for small and medium-size workgroups. Publishing, sharing, and viewing documents are simplified and new tools make collaboration more efficient.

eRoom is tied closely to Microsoft products. Microsoft Internet Information Server (IIS) is required as the Web server, and the 8.5MB client runs as an ActiveX control. This means Netscape Navigator users must install the CaptiveX plug-in. The other minor nuisance is that when adding documents, discussion comments, or when voting, response time is a bit slow.



COLLABORATE: *Documents, folders, votes, notes, and links can all be created in an eRoom.*

This new version of eRoom has integrated version control, an improved voting facility, and the ability to drag multiple files from an eRoom to the desktop—making it easier to edit multiple documents simultaneously. Perhaps the biggest change is that eRoom is now offered by Exodus and Computer Associates' NetHaven division as a service for companies that don't want to manage their own server.

eRoom focuses on making IIS more document friendly. Web servers such as IIS fall short in assisting workgroups in uploading, sharing, and downloading files. Content-management solutions are expensive and demand that administrators and users learn a fairly complex package. eRoom ably handles this middle ground.

eRoom uses a room metaphor to organize related items. Files can be dragged to and from the desktop into these shared, virtual document rooms. Version control with annotations helps track document changes. This interface is best suited to small and medium-size workgroups and became unruly when we added more than 100 items.

Other capabilities (threaded discussions and voting, for example) are included to facilitate collaboration. Participants can create discussions using rich text for added emphasis. Users can also call for votes by posing a question and a list of valid responses; the creator decides if the voters can write in responses. We found this helped turn wandering collaborations into firm decisions.

If you want to use your IIS Web server for document sharing, eRoom makes it palatable.

eRoom 2.0. List price: $99 per user (for 50 users). Requires: 32MB RAM, 50MB hard disk space, Microsoft Windows 95, 98, or NT for client; 128MB RAM, 128MB hard disk space for server. Instinctive Technology Inc., Cambridge, MA; 617-497-6300; fax, 617-497-5055; www.instinctive.com. *410 at www.pcmag.com/infolink.*

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WinBook

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* Based on 7/98 audit of notebook computer pricing in Ziff-Davis Publications.

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He hates giving speeches. In less than an hour he'll be in front of the entire IT department of the company. Rehearsing his speech in his head, he reminds himself not to forget to mention how successful the implementation of the new [1](employee self-service HR application) has been. The CEO will be there, so he also wants to point out that the [2](server consolidation program) and Y2K project are finished and, most importantly, within budget. The elevator doors open. His [3](pager) vibrates. It's an e-mail from his wife. She asks him to remember to pick up a tin of smoked eel on the way home. He bumps into the lead Webmaster in the hall who tells him that they've been able to take on new projects since they have dramatically [4](reduced the backlog) on Website change requests. He makes a mental note to say something in his speech about how well the Web team is doing. He looks down and sees, to his horror, that he's wearing two different color socks.

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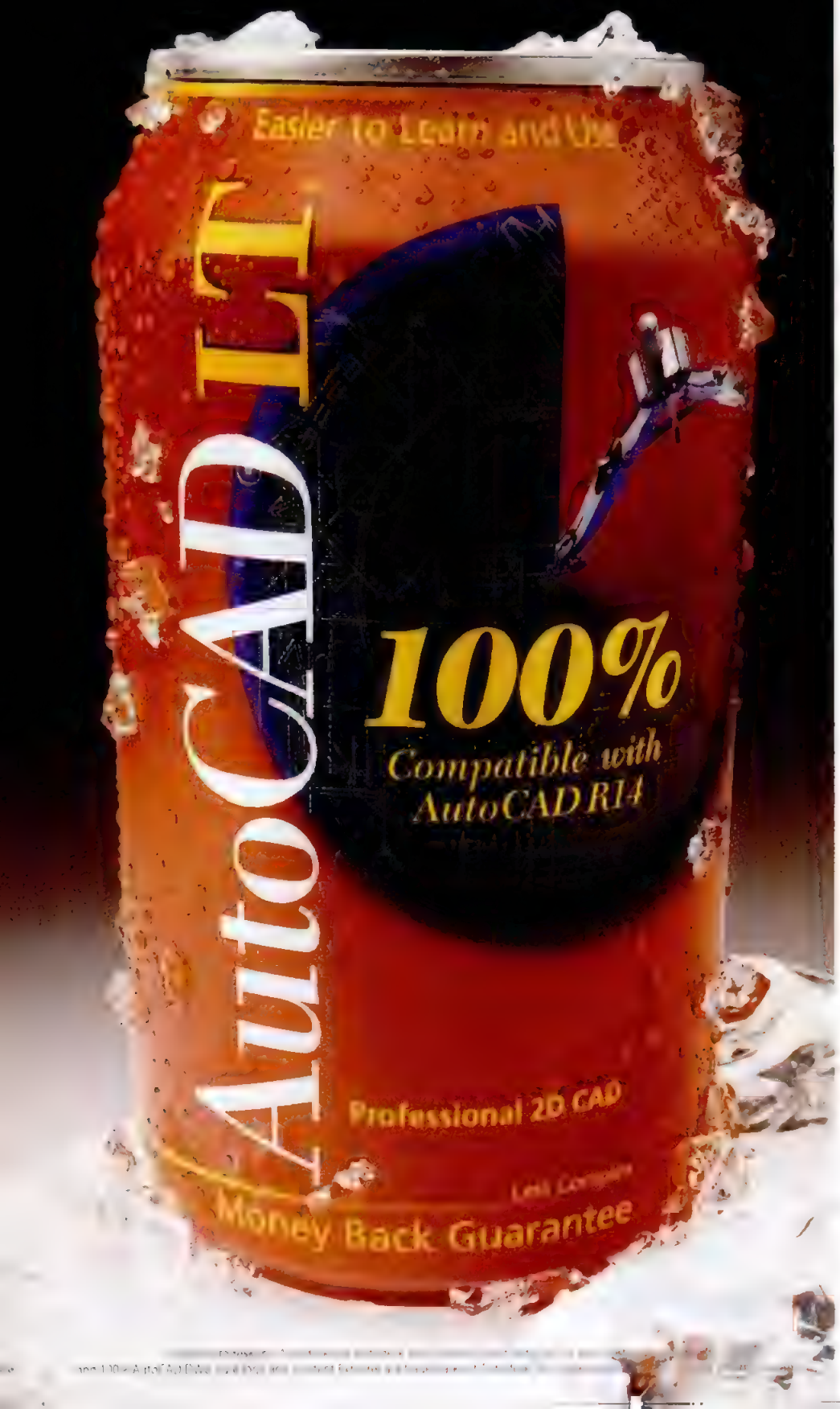

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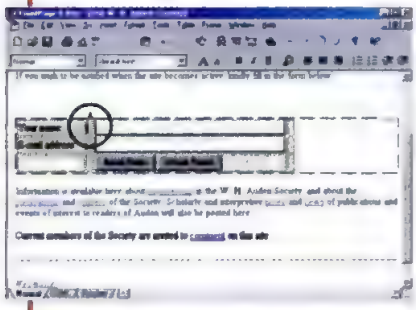
Second Looks

MICROSOFT FRONTPAGE 98

Work Around the Quirks

By Edward Mendelson

Microsoft FrontPage 98 was *PC Magazine*'s Editors' Choice in "Web Authoring Tools" (January 20, 1998) when we surveyed the field this year. The product continues to outrank the competition, thanks to its tightly integrated tools for site management, page editing, and uploading. Learning to live with FrontPage, however, means learning workarounds for some of its quirks and annoyances.



FIX: *An update fixes incorrect removal of nonbreaking spaces in tables.*

Many of you complained that FrontPage 98 forced you to create a whole Web site when you merely wanted to create a single page. The workaround is to create a shortcut to the FrontPage page-editor program, FPeditor.exe. The shortcut opens the editor without site management tools.

If you want to edit a page without drilling down through FrontPage's management tools, find the page in Explorer and choose Edit from the right-click pop-up menu to open your page in the FrontPage editor.

When you use FrontPage to edit a page created in another editor, it makes slight but sometimes significant changes in the imported code. Some problems are merely annoying, like the program's habit of removing carriage returns in form codes; this makes the HTML almost impossible to read, even though the code works correctly in a browser.

Other problems are more damaging, such as FrontPage's occasional inability to parse JavaScript correctly: Some parts of the code appear on the page as text and the script becomes unusable. If you don't save the file after the program damages it, your original will be safe; but if you do save the damaged file, the original will be lost forever if you haven't made a backup, since FrontPage doesn't back up your original file.

After our review appeared, we heard from readers that the FrontPage Server Extensions didn't work. (The extensions let FrontPage create automated Web sites without the need to write scripts.) But in our testing, the extensions worked as advertised, and thousands of Web sites use them successfully. FrontPage is the only product available with this feature, and the package remains the choice among WYSIWYG editors for small-business and household users.

Microsoft recently posted a patch (*www.microsoft.com/frontpage/resources/98update.htm*) that updates FrontPage to FrontPage97b. The updater fixes minor problems mostly affecting hand-coded HTML imported into FrontPage or created in its HTML-coding window. The first release sometimes incorrectly removed nonbreaking spaces from otherwise empty cells in tables with background colors and moved hand-coded font tags so that some hyperlinks were shaded with the wrong color.

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Tell us what you think... How do you like the new products you're using? Second Looks is your forum for feedback. Join us online to tell us about your experiences. We discuss a different new product every week and summarize your comments here.

Web TV, Pro *"Well . . it seems a lot of people are down on WebTV, which really is no surprise due to its inherent limitations (plus I suspect a lot of die-hard "PC Heads" are just showing sour grapes), but the fact remains that it is an easy, inexpensive way for someone to ease into the world of the Internet. After all, if you don't like it, you don't have to use it, but don't trash it."*
—Steve Senes

Web TV, Con *"I think WebTV is a useless toy for people who are scared to go out and buy themselves a real PC. Also, TV resolutions are so bad that the Web (as it is currently designed) is practically unreadable from 5 to 10 feet away. Of course this could all change with higher-res TVs and dedicated Web designers willing to create sites that look good on TV."*
—Fred Frize

IOMEGA BUZ

Debugging the Buz

By Jan Ozer

Our initial review of the Iomega Buz ($200 street) found three flaws; Version 1.2 of its new driver (available at *www.iomega.com*), corrects all of them. This update makes the Buz a great choice for capturing video for output to tape or for compressing for CD-ROM or Internet distribution, though we still favor parallel-port devices for still-image capture and MPEG-1 encoding.

KILLER CAPTURE: *With its new driver, the Buz is great for pure video capture.*

The most significant problem in our earlier review was the 3-MBps data-rate restriction, which caused noticeable artifacts in the captured video. With the new driver, the limit has increased to 6 MBps, which we successfully attained on a 200-MHz Pentium/MMX PC. At the higher rate, video was crisp, clear, and artifact-free, with bright colors and sharp detail.

The first Buz release also suffered from a field-ordering problem, which marred the appearance of edited and rendered video. We tested several clips without problem, confirming that Iomega has also resolved this issue.

Our final issue was a bug that prevented still-image capture in 15- or 24-bit format, forcing us to capture in the lower-quality motion JPEG format. Although the new driver has fixed this problem, Iomega still doesn't deinterlace the captured images, causing venetian-blind artifacts in bitmaps. Note that this doesn't present a problem for smaller images that don't need deinterlacing.

As with all PCI-based video-capture products, the Buz has some incompatibilities, which are listed on Iomega's Web site and detailed in newsgroups such as *rec.video.desktop*. Parallel-port devices avoid these specific problems, so they make better choices for capturing still images and MPEG-1 videos. But no parallel-port product (and few PCI-based products) can match the Buz's prowess at pure video capture, which makes the Iomega unit a great choice for general-purpose video production.

PHOTOGRAPHY BY THOM O'CONNOR

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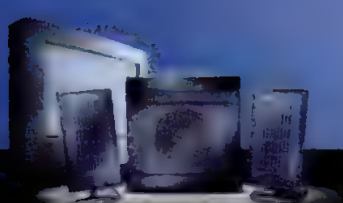

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BILL MACHRONE

Those Pesky Copyrights

How much of the stuff on the Web violates someone's copyright? Plenty. The Web is a huge headache for the protectors of intellectual property in general. But it is also a way to share information and ideas that would otherwise be unavailable. This suggests that we need to revisit permissions and fair-use laws.

Since examples abound, I'll choose one that's dear to my heart: music and song lyrics. Virtually all successful popular artists and groups have songbooks produced in parallel with their recordings. The books, however, go out of print quickly unless the songs or groups are unusually enduring or endearing. You can go into any music store and find a copy of Paul Stookey's "Wedding Song" or the Eagles' greatest hits. But try to find a copy of Tommy James and the Shondells' "I Think We're Alone Now" or the Ronettes' "Walkin' in the Rain." Songs such as these are minor pop masterpieces but don't make it into the anthologies. And we won't see a new release unless some punk band does an ironic cover.

Fake books—copyright-violating collections of melody lines, chords, and lyrics—have lived below the radar for decades. Professional musicians (wedding bands, especially) improvise from them and thus can play Aunt Lydia's favorite song. The vast majority of musicians, though, play songs for nostalgic reasons, to amuse themselves and their friends; amateur musicians tend to play more by ear, and although they remember the melody and the beat, few remember the lyrics. (Just try to remember all the words to Marty Robbins's opus "El Paso.")

Into this vacuum of forgetfulness leaped Lyrics.com, a collection of song lyrics from the last five decades, all contributed by volunteers. The collection grew to 30,000 songs but faced extreme pressure from musicians' agencies and copyright holders. The owners closed Lyrics.com but wound up reopening the site in Switzerland (*www.lyrics.ch*). I'm not sure why Switzerland is a place to hide out from U.S. copyright law, but there it is.

The On-Line Guitar Archive (OLGA) has run a parallel course in recent months. In addition to lyrics, OLGA also has chord symbols and tablature, a guitar notation system that shows you where to put your fingers on the different strings. As with Lyrics.com, OLGA's material has been contributed by enterprising amateurs, who typically listen to songs over and over to figure out how they were played and then laboriously notate their work in tab. Is OLGA republishing copyrighted works? Undoubtedly. It claims, however, that copyright law permits a copy of a work to be made for research, personal study, or education and that OLGA exists to teach guitar technique. This latter statement is true; OLGA does have some decent content on technique. The question is whether the research claim holds water. Under threat of legal action, OLGA is officially closed (although as I write this, a number of mirror sites are still active).

ART PRESERVATION

Copyright laws can't cope with the Web and the interests of millions of amateur musicians.

Since my fondness for things musical is well known, I've gotten a fair number of e-mails asking me to take up OLGA's cause. Given the state of copyright law, I think that OLGA probably infringes. That said, I think that the law is also inadequate to the task of coping with the Internet and the interests of millions of amateur musicians.

It's likely that very little if any harm is done to the copyright holders. The vast majority of songs on Lyrics.ch and OLGA are not in print, and the lyrics are all but unavailable. Like the Grateful Dead's famous "authorized bootleg recordings," sites such as these probably promote sales of recordings and sheet music by raising the overall interest level in an artist or keeping an old flame alive.

I'm no expert on copyright law, but I would like to see a level of protection for enterprises that exist primarily to preserve art, not to exploit it or cheat copyright owners out of their due. Why couldn't a very low fee structure be set for such sites, something that could easily be covered by banner ads? The process could be handled by copyright clearinghouses like ASCAP and BMI, just as music played in restaurants is.

The song is one of humanity's highest forms of art, a confluence of melody and rhyme that, at its best, can make a lifelong impression, convey our deepest emotions, make us laugh, or rally a nation. It transcends the performer and attains a life of its own. It should be able to spend some portion of that life online, legally. PC

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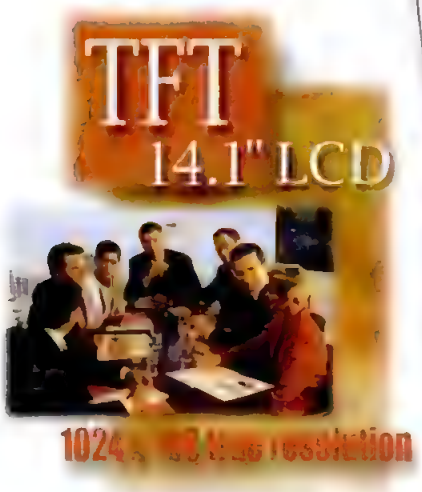

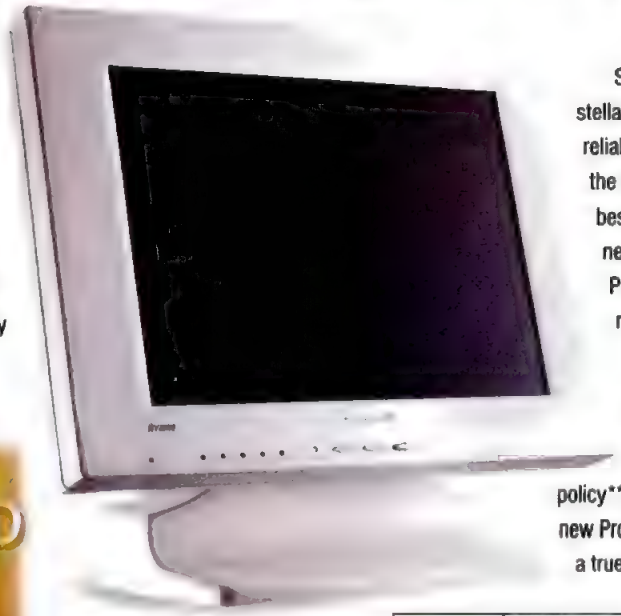

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The Software Protection Racket

Since the invention of the shrink-wrap software license in the late 1970s by Micropro CEO Seymour Rubinstein, it's been a controversial mainstay of the industry. If there is any doubt as to the future of this system, it may well be laid to rest by the state-by-state passage of the newest iteration of the Uniform Commercial Code—and specifically Article 2B, which concerns computer software and databases. The entire licensing situation will be codified for good. Controversy over the shrink-wrap license will be over forever. It will be valid under all circumstances, period. In fact, Article 2B is so comprehensive that some critics say you cannot even write a software review under certain licensing agreements without violating the law.

I recently asked Rubinstein why he invented the idea of licensing software for personal use.

Rubinstein: *In the early days of personal computing, developers quickly got the idea that if you "sold" them software, they owned it, literally. They didn't understand that they were just being allowed to use it. Something had to be done.*

Dvorak: *Do you think the notion of the software license has outlived its usefulness?*

Rubinstein: *On the contrary, this is actually a major trend that will flow over to all intellectual property. Authors will license the right to read a book, for example.*

CONTROVERSY over the shrink-wrap license will be over forever. It'll be valid under all circumstances, period.

When I began to write this column I was about to argue that, indeed, the software license was at the end of its usefulness. Writers have never had the kind of protection for their intellectual property afforded software developers. I've found numerous examples of old columns of mine passed around the Net. The famous "Sally Gates" column I wrote for *Computer Currents* about 15 years ago is floating around the Microsoft e-mail system. My name was taken off the thing, and it has essentially become a public-domain piece of Internet humor for which I get nothing. Gates, meanwhile, has the Business Software Alliance working for him cracking down on bootleggers.

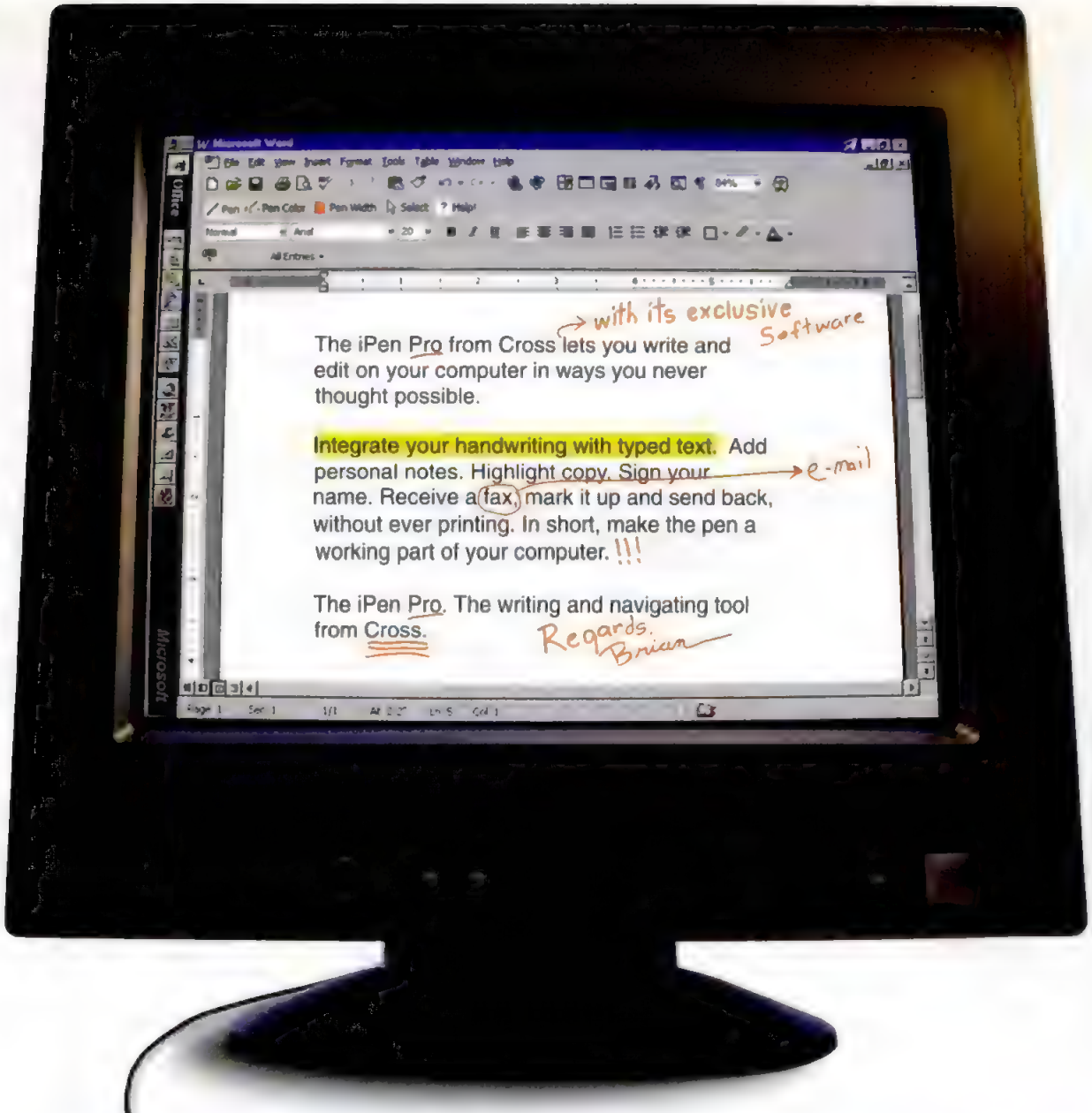
Musicians are protected in all sorts of ways through the ASCAP and Blackwood royalty collection mechanisms. When a song is played on the radio they get a royalty. No such protection is afforded to writers. Writers, despite the absolute lowest level of protection, can still eke out a living, but the artists who have more protection get more money. And the newer the art form, the more money they get, as their protection mechanisms are more advanced. It's the software folks driving the Ferraris, not the writers.

Whether the license concept can actually be adapted to cover all intellectual property, including writing, remains to be seen. I don't think tradition will allow it. Besides, there are too many writers who work on the cheap just to get printed. But in case you haven't noticed, Microsoft has huge license agreements attached to all its Web sites. The new Uniform Commercial Code will make them all contractually binding. How this matters to anyone we don't know.

There's an interesting gambit played out by the license concept. Licenses are contracts, and in today's system of justice the civil courts are where most of the action and much of the justice are taking place. Don't forget that O.J. Simpson was found guilty in civil court, not criminal court. The criminal courts are not going to deal with someone who violates a shrink-wrap agreement. There are murderers and burglars and drug peddlers higher on the list. But the civil courts will handle contract violations, and that's what a shrink-wrap license is—a contract. More interesting, such licenses keep software companies from having to go to court to defend the fact that they cannot produce bug-free code. The license says that's okay.

For writers and artists, though, what kind of protection would a license afford? Would a license make it possible to avoid nuisance libel suits, and if so make it easier to get away with actual libel? Nobody knows what might evolve. Remember that Rubinstein's invention had a narrow early goal: to keep people from "owning" the code.

I'm prepared to argue either side of the licensing issue, but if Rubinstein is correct in his assessment, then half of my arguments will be moot, as the license not only is here to stay but will expand its territory. As Article 2B grows more teeth, there is nothing to stop it. The shrink-wrap license agreement will be stronger than ever, and we are going to have to get used to it.



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JOHN C. DVORAK

Inside Track

As the move toward **oblivion** continues, mergers and acquisitions are getting more unusual and more **dangerous.** Larger and larger companies are merging to make still larger behemoths that are difficult to manage. The most interesting is the AT&T and TCI cable merger. Here we have the largest phone company merging with one of the largest cable operators, and they must be imagining all sorts of things they can do together.

What befuddles me is that the analysts and pundits all think this is a good thing. There's a claim that the mergers will somehow benefit the public, with lower prices and more services. This is despite the fact that such deals always result in worse service and higher prices. I don't understand why any of this is **encouraged.** What was once "the phone company" was **busted up for a reason.** Over time, the one big company was slow to innovate and overcharged its customers. When it was broken up, the old core took over the long-distance business, because it could still overcharge in that arena. If that's not true, why does everyone always say the "lucrative long-distance business"? It's never just called the "long-distance business." Long distance is **so lucrative** that many competitors steal customers from one another by illegally signing them up—whether the customers want their services or not. In other words, this merger situation sucks. End of diatribe 1,123.

What was once "the phone company" was busted up for a reason. Over time, the one big company was slow to innovate and overcharged its customers.

Whither the Picture Tube Dept.: Almost all of the LCD flat-panel vendors are showing the newest **direct digital LCDs,** and the quality is **eye-popping.** One display-card maker was showing a large panel, to be released later this year, with resolution hitting 1,600-by-1,280. And the folk from Princeton **shocked the industry** by being the first out of the gate with a 17-inch display, complete with a video card producing a resolution of 1,024-by-768, to sell for under $1,000. I wouldn't think twice about buying this system, having seen it.

Although I have cautioned people about the connector controversy regarding the new displays, I now believe that nobody will care if a standard connector fails to appear immediately. You'll just use the panel and card that came with the display and hope an adapter comes out in the future. This is because the images on these digital panels is beyond comprehension. **You'll want one the second you see it.** If you can get a look at this relatively inexpensive Princeton rig, you'll be stunned. Princeton may reemerge as a leader in monitors, if it can make enough of these.

Analog LCDs, it turns out, have **numerous anomalies,** because of the conversion from analog to digital to analog. There is microscopic flicker and noise on the screen. You notice this when you compare it with the all-digital displays. **ViewSonic,** one of the analog players, introduced probably the last generation of analog LCD, which compensates for the blur factors and looks almost as good as the digital, but I'm sure even ViewSonic will switch over when possible. I was impressed with the ViewSonic machine, but digital is obviously the future. Princeton has **no legacy** LCD technologies to worry about, so watch this company push it.

Apparently all the video card makers are doing cards for the digital LCD panels, and there's a **tie-in with HDTV,** too. At Comdex, I expect everyone to be on board and the connector issue to continue.

While talking to Nokia executives at a briefing in Finland (life is tough), I was told that the **rush to 21-inch monitors** exploded at such a frantic pace that the company was actually **forced to air-ship** these **monsters** to the U.S. to keep up with demand. I believe some of this is due to the aging of computer users and their waning eyesight. People need **bigger** and sharper images. The sharp, high-refresh-rate monitors are just the ticket—for now. Nineteen-inch digital LCDs are on the horizon. The high-end buyers will flock to them eventually.

The irony of the new digital technologies is that clarity seems to be the big attraction and yet is something not fully understood by the analog user. That is, if we are to believe my own eyes and the people at Number Nine I discussed this with. It seems that, of all things, nobody has been routinely testing for **image clarity** until a few Japanese magazines made it a cause célèbre. I only found out because I was disappointed with **the noticeably blurry image** I was getting from various display cards when I compared them with the Matrox Millennium and the Number Nine.

Thanks to the Windows 95/98 architecture, I'm unable to consolidate my programs on one machine, which means I have four networked machines on my desktop. (I've complained about this before.) I began to notice that not all the cards would produce a clear 1,280-by-1,024 image on the exact same monitor. It was often just plain blurry. The Matrox and Number Nine cards were the best. Number Nine, which says it has the sharpest image, period, claims that most monitor testing is done with its cards. The supposed reason for the discrepancy in sharpness from card to card? Apparently the offending cards are using **cheaper discrete support components** to save a few pennies. Nobody cared about this (or even noticed it) when running 800-by-600 resolution on a 15-inch monitor, but it gets noticed on the big tubes. Another irony is that all this changes when we go to digital LCDs. PC

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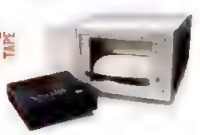

JIM SEYMOUR

PC Industry: "Don't Buy That New PC!"

It's insane, I tell you! *Insane!*" Harry's words nearly melted the phone line. Sure, he's something of a wild man, a funny, tart-tongued Aussie who helped midwife the exploding computer telephony business worldwide over the past five years. A guy who has small patience with stupidity, with an unfailingly...umm... colorful way of expressing himself. But he usually doesn't get this cranked up. "Insane! It could be the end of the PC business! The end of *PC Magazine!*"

Harry Newton started *Computer Telephony* magazine a few years ago, followed shortly by his Computer Telephony trade shows. His timing was exquisite: He got in just as CT was taking off. And he got out neatly, too, recently selling his interest in the company and the trade shows for a sum well north of $100 million.

Harry is a smart guy, more than ordinarily computer-savvy, well connected. He knows where to turn for answers to vexing computer problems, whom to call. But he had been beating his head against the wall for a day and a half as he set up his new Toshiba notebook, and it was still a $5,700 boat anchor. Sure, it ran faster than the older Toshiba notebook he'd been using—but it wasn't yet nearly as useful as the older machine, because Harry was still trying to teach it how he liked to work. And that was the source of his considerable irritation.

Our mutual friend Frank Derfler had forwarded an angry e-mail from Harry a few days earlier. It recounted his weekend-long agony, trying to get Win 98 and the handful of applications Harry relies on set up properly on his new machine. Two more notes followed. "Latest Upgrade Horror" was the subject slug on the latest one.

Harry: "Nobody should live through my last 16 horrible hours. I fell into bed this morning at 3:45 A.M."

I had to call Harry. This was serious.

From his very first note and from years of personal pain on exactly the same issue, I knew what had ticked him off: how stupid Windows and Windows applications are about bringing over your personal-customization files for those apps—and for Windows itself—from an older machine to a new one.

Harry: "Nobody should live through this. Many people in the future won't. They'll stay with their trusty PC or laptop and skip the new speed, the new bells and whistles. They'll avoid the upgrade aggravation. Who needs it?"

Exactly. First you sit there and pump Windows and the apps onto your new PC's hard disk. Tedious, often frustrating, but tolerable. (Oh, for the days of DOS and just LapLinking whole directories of EXEs and COMs over to your new machine, ready to run!)

UPGRADE INCENTIVE

Incredible as it may seem, the PC business has built up a barrier to upgrading.

Then comes the really bad news. No Windows apps I know make it easy to move your personal preferences for those apps over to a new installation. Your Word custom dictionary, all those frustrating settings you F-I-N-A-L-L-Y G-O-T R-I-G-H-T in Excel and PageMaker and Eudora and Approach and Quicken and Norton and Corel, ad infinitum. All that stuff gone, down the drain, just because you had the temerity to buy a new computer.

So, installation complete, you pull out a CD-ROM and open, say, Excel, and you start plugging in your preferences—the ones you can remember and the ones you can find places to enter—in all those damned tabbed dialogs. But of course you can't remember them all, maybe not even half of them. And some go in Format Options and some in plain old Options and some in Format | AutoFormat While You Type and some in Format | Auto Format Whether You Like It Or Not and some in Preferences | General | Sort Of | Odd-Numbered Days.

And you sit there, knowing you are destined for weeks of seeing headers like "September 13, 1998, 3:12 P.M." on your worksheets, whether you want them or not—until, of course, you remember to go change that.

Then you get to start on PageMaker. And so on.

It really is insane. And bizarrely, this kind of programmers' stupidity has actually begun to create a disincentive to upgrade to newer hardware among many users. For myself, I know I upgrade to a newer notebook about half as often as I'd like to and can afford to. And I'm not alone.

As Harry pointed out none too gently in one of his more desperate notes, upgrading doesn't have to be this way.

Harry and I can think of three easy ways to fix this.

For one, all applications could write all your personal

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settings in preferences files (.PRF?), which would be stored in and read from a single, fixed location folder/directory on your hard disk—say, C:/Windows/Prefs. (That's pretty unlikely, because so many software vendors—Adobe comes quickly to mind, but it's hardly alone—already have their own bizarre and unfathomably complex schemes for where their apps' user preferences and other customization files are kept.)

Move on to a new machine and you'd just copy over those Prefs files, intact, to the new box's hard disk. As you loaded same-or-later-release versions of your apps onto the new PC, they'd look in that folder for their customization data.

As a second cure, Microsoft could fix this in the next release of Windows—NT 5.0, in 1999—by creating a second Registry-like file (Prefs.Dat?), which would store pointers to every app's customization files. If the customization were truly trivial, the data might appear in the Prefs.Dat file itself. But more likely, the file would consist of lines of pointers to locations on the machine's disk where each app's own Prefs.Dat files could be found. When you moved on to a better machine, you would use a Zip disk or another bigger-than-a-floppy disk, or a network connection, to move those Prefs.Dat files and all their linked files over to the new box. (A function something like PageMaker's Prepare for Service Bureau command would find and bundle up all those files, making the process automatic, error-free, and nearly painless.)

Third, a Symantec could add a solution like this through a disk-management utility, such as Norton Utilities. It would be a better fit in the operating system, but given Microsoft's agenda, I wouldn't hold my breath waiting for a solution from Redmond. Something like Norton's Rescue Disk plus its Zip Rescue scheme could make the process quick and easy.

Harry: "This is *so* stupid. So frustrating."

I'm sure there are other, probably better ways to handle this. But we've got to do something. And fast. Because, as incredible as it may seem, the PC business has built up a barrier to upgrading—Bill Gates would probably call it a barrier to innovation, given the popularity of the *I* word in Seattle this summer—that is going to hurt the industry.

Not to mention hurting you and me. And Harry.

Harry: "That's it. No more. I'll have this one till I die. The end of upgrades. The end of buying." PC

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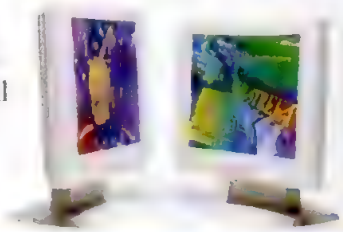

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BILL HOWARD

New Dimensions for Wireless LANs

Imagine delivering all the water needs for New York's World Trade Center through a 1-inch garden hose. Or all your home water needs through a soda straw. For the delivery of water, such things are never going to happen. But when it comes to networking homes and small business offices, you'll be amazed at what you can do with the smallest, simplest wiring, which is already in the walls. The household wiring equivalent of soda straws is going to give you 10 megabits per second very shortly.

Elsewhere in this issue we review simple LANs suitable for homes and small businesses ("Networks Made Easy"). Here's my take on the technology.

Six months ago I was upbeat about AC-line networks ("The Wired Home," March 24, 1998), and I thought phone-wire LANs were going nowhere fast. Actually, it's the phone lines that have the most exciting near-term prospect for products late this year and next year. AC-power-line LANs seem to have more mixed prospects now. And completely wireless LANs are worth considering, but their drawback is price: Most people want to spend $99 a node for networking, and wireless runs several times that.

WIRED UP

It's the phone-wire LANs that have the most exciting near-term prospects.

Earlier, I liked carrier-current (AC-power-line) LANs because Intelogis (*www.intelogis.com*) was shipping a 350-Kbps LAN, and there were hints that other vendors would offer anywhere from 1 Mbps to 10 Mbps within 12 months. News reports had Intel hard at work on an AC LAN. By early summer, Intel was singing an additional tune and mouthing the praises of the Home Phone Networking Alliance (HomePNA, *www.homepna.org*), which announced an Ethernet-like 1-Mbps home network that should be out by year's end, costing about $100 per connection. You can use existing phone wire already installed in your walls and running along your baseboards, and unlike 10Base-T Ethernet, the network doesn't require routing the wiring back to a central hub. (The phones still work.) The first round is being developed by Tut Systems, which has Microsoft funding. A follow-on, backward-compatible 10-Mbps phone LAN is being developed, supposedly for late 1999 release, by Epigram. HomePNA backers include many of the industry's heavy hitters: AMD, AT&T Wireless, Compaq, IBM, Intel, Lucent, Rockwell, and 3Com.

In case that's not enough speed, Interval Research (*www.interval.com*) has been demonstrating MediaWire—networking, telephony, audio, and video distribution that pushes an aggregate 44 Mbps across *silver satin*, the shiny gray cable that runs from your phone to the wall jack. This may be about two years out, but prototypes I saw recently provided audio that was close to CD quality and TV that was a bit soft but still impressive.

The dark horse is radio-frequency (RF) wireless. (The nonstarter for multiroom wireless is infrared, because IR, of course, doesn't go through walls no matter how much you crank up the power.) This, too, has a consortium, the Home Radio Frequency Working Group (*www.homerf.org*), which includes Compaq, Ericsson, HP, IBM, Intel, Microsoft, Motorola, Philips Consumer Communications (a Philips/Lucent venture), Proxim, SpectraWave, and Symbionics. Notice that many of the vendors have some eggs in every basket. The consortium's Shared Wireless Access Protocol would run at about 2.4 GHz at 1 Mbps to 2 Mbps and cover your home and backyard. The first few iterations of these products would have to struggle to get down to $100 a module.

Don't confuse this with Bluetooth, a 2.4-GHz short-haul protocol for communicating between PDAs, laptops, cell phones, and printers within a 30-foot range. Think of this as the RF successor to IrDA, the barely used 4-Mbps infrared transfer scheme that's on most all laptops but little else. Bluetooth might be out sometime in 1999. Backers include Ericsson, IBM, Intel, Nokia, and Toshiba (*www.bluetooth.com*). If Bluetooth succeeds, life will be truly wonderful for road warriors. There's even a proposal to put Bluetooth transceivers on airplanes, and backers claim the devices will provide—unlike airphones—reliable and fast air-to-ground communications. But I can hardly wait to see the per-minute charges.

Even as we move forward on multiple fronts to deliver simple networking without new wiring, I'm still convinced you should, at the same time, see whether you can lay in traditional network cable as part of an office expansion, remodeling, or move. With Category 5 Ethernet wiring, a known and reliable commodity, you can have 100 Mbps—guaranteed—for $50 to $100 a PC. It's here and it works—today. PC

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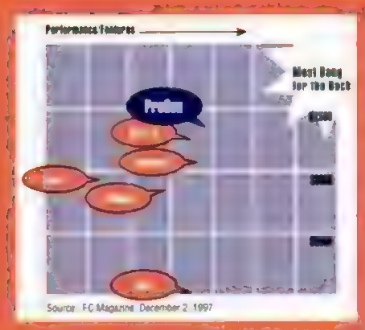

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Home on the Web

Everything old is new again: The hottest sites on the Web are filling the role that online services once did. AOL and 11 sites vie to be your home page.

By David Lidsky

The immense and rapid growth in the Web's popularity during the past three years led to a precipitous pronouncement of death for the online services, such as America Online (AOL), that preceded the Web in the wired world. While everyone lauds the Web for offering unbridled opportunities to explore and discover new things, a lot of people still want someone else to aggregate a variety of interesting content in one place instead of creating massive and unwieldy bookmark files in their browsers. People still want to settle into a community of users online.

Gee, where did we go to get these things before? Bingo. Online services.

We went so far in the other direction, we've come all the way back. With the exception of AOL, though (which, of course, never went away), the new online services are Web sites, delivering the old formula of content, community, and core services such as e-mail, but in a new bottle—a trim Web interface instead of the clunky proprietary software that plagued the likes of CompuServe, MSN, and Prodigy. CompuServe has been dormant since being bought by AOL, MSN is going the portal route, and Prodigy has refashioned itself as an ISP.

At your next cocktail party, however, don't be caught using the tired phrase *online services*. Now, we're calling

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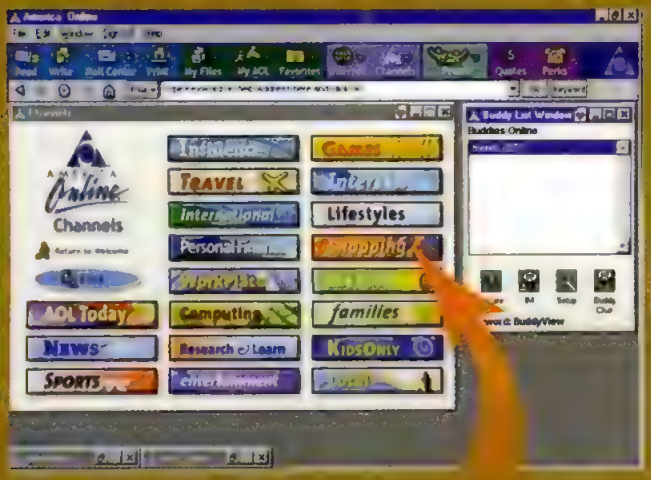
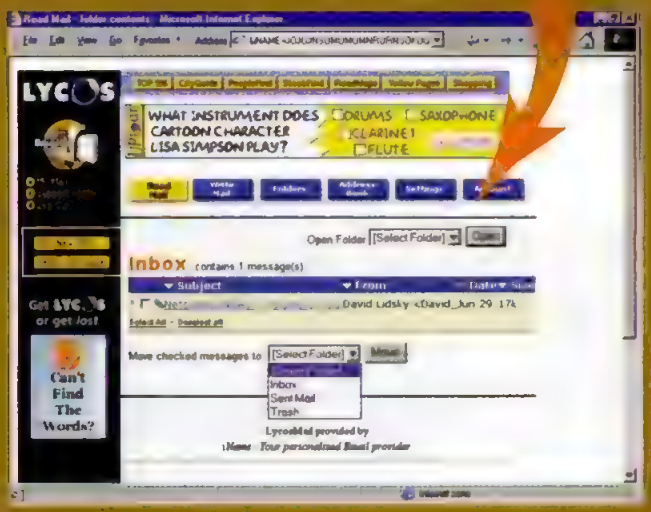


CHANNELS Making it easy to locate the information that interests you by categorizing everything into channels is one of the key functions of Web portals. AOL was a pioneer here, and other Web portals have learned from this and basically followed suit, putting their content into 14 to 18 easy-to-recognize subcategories.

E-MAIL The most popular online activity has become a standard [illegible] frequent the site and feel a connection to it. LycosMail, as with many other mail clients—both Web-based and standalone—can view HTML mail, as well as let you create folders and set up an address book



AltaVista	102	Netcenter	128
AOL	104	Planet Direct	133
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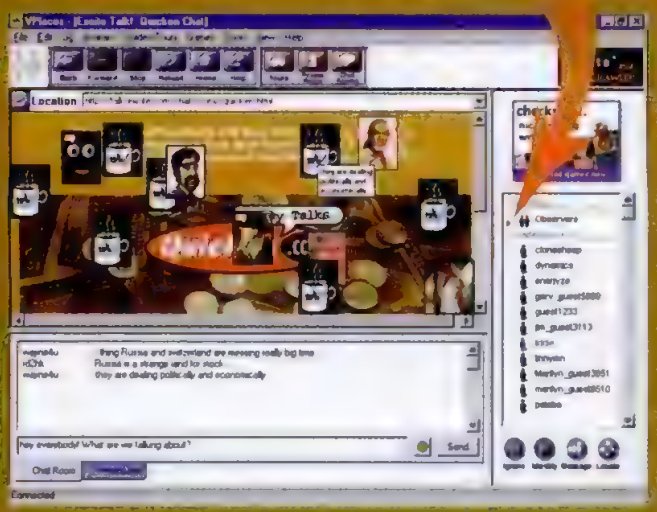
CHAT

Being able to have a forum in which to share ideas and meet

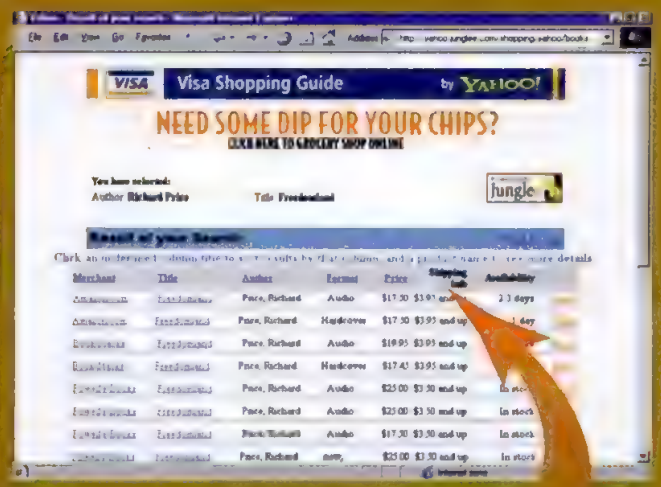


SHOPPING

The Web has become a giant bazaar for goods and

aggregating links to Web commerce sites and giving

includes a low-price finder that lets you search across the Web for the best prices on items such as books.



PHOTOGRAPHY BY DAVID McGLYNN

them *Web portals*. But don't be fooled: A Web portal is just a next-generation online service.

A Web portal is where you start your day on the Web, getting a little news, the scoop on what's happening online, and—if the portals have their way—it's the epicenter of your Web experience. You return there when you get lost. Your stock portfolio is there, and you can look for new and old friends to chat with online. You get your e-mail and build your personal home page there: The portal is your security blanket, your safety net, and your trusty guide to all things Web.

Web portals all pretty much feature the same mix of content and services. The differences come in how well the sites integrate all of their offerings; the quality of the technology providers selected to deliver Web-based e-mail, chat, instant messaging, and Web page communities; the ease with which you can use and customize the service to your needs; and whether you can find people there that you want to spend time with online.

Unlike AOL, the "pure" Web portals are free from the burdens of providing access and software for users. But that comes with its own price: A portal has an incredibly tenuous hold on you because you're just a click away from somewhere else, and you never have to return. Even AOL has you only for a month at a time. These services had better be compelling enough for you to choose one as the starting point of your day, or at the very least, to make it a regular stop on the Web.

This desperate need to hold on to you once these services get you—and they often get you through luck, inertia, or both (based on which computer you buy, which ISP you select, or which browser you choose)—explains why AOL, Excite, Yahoo!, and the others move at a dizzying pace to add content partners and new features before their competitors do. Today's unique new feature is tomorrow's commodity item in the Web portals market.

This frantic pace produces unfortunate side effects for users, who can often feel they're using a different service from one day to the next. New content and features are prominently showcased upon launch only to be later moved and marginalized once they're yesterday's news. Other features disappear quietly. At Infoseek, we had chat services change in midstream with no notice; at Yahoo!, we saw other features get moved so that we could no longer easily find them on the site.

This is highly disconcerting and helps defeat the basic premise of a portal, which is to help you find content and offer community. The need to innovate should be balanced by the risk of alienating loyal users who are used to finding what they like in the same place.

Most Web portals have tried and basically succeeded in giving users a managed online experience, just like the old online services once did, and they can definitely serve a role for users, particularly new Web users. Note, though, that literally any site, or even a blank page, can be your online starting point or hangout (although we suspect you'll get bored staring at a blank page after a while).

We review AOL and the 11 sites that are most clearly seeking to be full-fledged portals to determine how effectively they fulfill this mission. Visit each for yourself and evaluate it as a burgeoning community and determine which portal, if any, best suits your needs.

Our Contributors: ALAN COHEN, JILL LÉGER, and KATHRYN MUNRO are freelance writers. JAY MUNRO was the project leader, and DAVID LIDSKY was the associate editor in charge of this story.

AltaVista

The verdict on AltaVista: A heck of a search site but not much of a portal. New content, such as headlines from ABCNews.com, is continually coming onboard, but the parts do not yet make an integrated whole. While other sites offer online communities, AltaVista provides a grab bag of tools, and only the search tools make visiting the site worthwhile.

AltaVista offers two ways to search for Web content—a traditional keyword search and a set of searchable directories licensed from LookSmart. You have 12 categories from which to choose, appearing as a list on the left side of the screen.

suitability to task

EDITORS' CHOICE

	AltaVista	AOL	AOL.com	Excite	GeoCities	Infoseek	Lycos	MSN Internet Start	Netcenter
Creating community	Poor	Excellent	Poor	Excellent	Fair	Poor	Excellent	Poor	Good
Personalization	N/A	Fair	N/A	Excellent	N/A	Fair	Good	Good	Poor
Web-based e-mail	Fair	Good	Poor	Good	Poor	N/A	Fair	Good	Excellent
Directory search	Good	Fair	Fair	Excellent	Poor	Good	Good	Fair	Good
News and finance	Poor	Good	Fair	Excellent	Poor	Good	Fair	Good	Good
Chat	N/A	Excellent	N/A	Excellent	Good	Poor	Good	N/A	N/A
Message boards	N/A	Excellent	N/A	Excellent	Fair	N/A	Fair	N/A	Excellent
Shopping	N/A	Good	Fair	Good	Fair	Good	Good	Fair	Fair
Classifieds	N/A	Fair	Fair	Good	Poor	Excellent	Good	N/A	Good
Games and software	N/A	Good	N/A	Good	N/A	Poor	Excellent	N/A	Good
Instant messaging	N/A	Excellent	Excellent	Good	N/A	Fair	N/A	N/A	Excellent
Free home pages	N/A	Good	N/A	N/A	Good	Fair	Excellent	N/A	N/A

N/A—Not applicable: The service does not have this feature.

• Excite

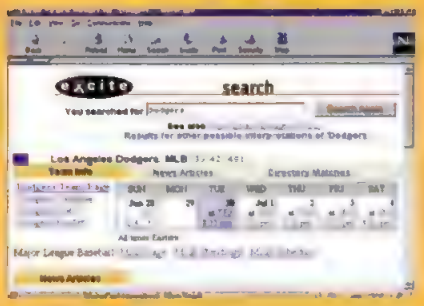
Content. Communication. Community. These are the core building blocks that make up a Web portal. Excite best delivers on these concepts, and so we award it our Editors' Choice.

Excite succeeds both as a literal start page and as a full-blown portal. We loved being able to create our own home page for Excite, and because it is literally *www.excite.com* that you customize, the experience is better than other sites that don't integrate "My" pages into their service as thoroughly.

Notable features that make Excite stand out from the pack and make it a worthwhile destination on the Web include its chat and message boards, which are lively and feature great software to improve your experience. Its anticipatory search helps steer you to information more quickly, and its navigation rarely left us at a dead end, even deep into the site.

Deserving of honorable mention are MSN Internet Start and Yahoo! Start is aptly named: We found its home page to be an excellent way to begin your online experience before moving on to other Web sites of interest. This highly configurable site is loaded with links to high-quality content. Let's hope that Microsoft's efforts to expand Start into a full-blown portal don't ruin the simple effectiveness of its home page.

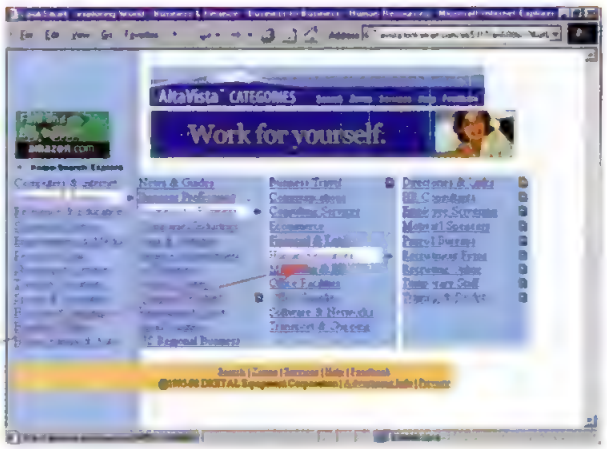
Yahoo! is an excellent site, loaded with great sections. But that's also its problem: We had trouble navigating through it and finding all of its features. Check out Yahoo!'s still top-notch directory of sites and some of its excellent aggregation of Web resources, such as Full Coverage for major news stories.



America Online is the last of the true online services, and it offers the single best community of users. But its embrace of the Web is still a bit tentative, which makes AOL difficult to recommend to all audiences.

You can search across all categories with a keyword or navigate through them. Choose a category, and a new set of subcategories appears right next to the original list. Click again and the choices get narrower still, until you reach a listing of relevant sites, each with a one- or two-line description. The process is quick and intuitive.

This is a more elegant approach than you'll find in Yahoo!, where you never see the entire hierarchy at any one time and you have to keep pressing the back button to see listings in previous categories. But Yahoo! offers much better integration, linking categories to on-topic chats and message boards, with greater depth in its listings.



AltaVista lets you search by category without losing your place in its directory.

And that's AltaVista's major flaw: The few services offered are not yet integrated, and many key features are missing altogether, such as chat, instant messaging, and message boards. Six content areas (Careers, News, Travel, Entertainment, Health, and Finance) are up and running, but each section is run by a separate provider and has a completely different look and feel.

AltaVista won't track your local sports teams, remember your favorite links, or remind you when it's Grandpa's birthday; the service offers no personalization features at all. Free e-mail is part of AltaVista's toolset, but the Web-based service is not well integrated into AltaVista. The e-mail is adequate but lacks some important features, such as filters, address groups, and a search capability. You'd be better off using Hotmail at Microsoft's site or using Yahoo! Mail.

AltaVista's search capabilities offer a compelling reason to visit this site. But once you've found what you want, there is little reason to stay.—*Alan Cohen*

Compaq Computer Corp., www.altavista.digital.com.

AOL

With Web portals offering a growing array of free services, the question must be asked: Why would anyone pay for America Online? You get Internet access, of course, but any ISP can provide that service, often for less than AOL's monthly fee. You get tons of content, both on AOL and the Web, but the best Web sites can equal or even surpass AOL's offerings and present the material in a cleaner fashion. So what's the appeal? It's simple: the online world's only full-fledged community. But AOL has little personalization, and even Version 4.0, which we reviewed as a public beta, has still failed to integrate with the Web as fully as it should. AOL 4.0 brings some improvements, but you can get Internet access from anywhere and use Excite as your portal for a more satisfying overall experience.

Better than any other service though, AOL integrates its community tools in a way that helps users come together—and come back again. AOL's many chat rooms are easier to use and better designed than the company's Web-based counterparts. Enter a room and a list of participants is displayed. Click on a name and you have the option of reading the sender's profile or sending an instant message, with the built-in instant messaging software.

AOL 4.0 offers more consistent navigation, with its constant panel of channels to the left of its proprietary windows.

AOL chat is undoubtedly the service's biggest draw, but its appeal is largest among young, single people. While there are a wealth of topics to choose from, the romance rooms draw the most users. Alas, the level of discourse will make no one forget *Nightline* or PBS. Indeed, most users tend to lurk in the rooms, reading other participants' profiles and not saying anything. When a user finds someone interesting he or she can send an instant message.

Because of its large user base and its efforts to give members exclusive events, AOL offers celebrity chats that involve—surprise—actual celebrities, not your downstairs neighbor who has written a book about pies. No other portal books as many A-list celebrities as AOL.

category portals

Any site can be your starting point on the Web. Here are the online hubs for the topics that interest you most.

CATEGORY	SITE	DESCRIPTION
Computing	ZDNet *(www.zdnet.com)*	PC Magazine Online's parent site delivers the high-tech goodies from all 18 U.S. Ziff-Davis publications as well as news throughout the day, Interactive Investor for the latest on the volatile tech stocks, software downloads, and ZDTV, soon to be available 24/7 on the Web via streaming RealVideo. Plus free e-mail and chat.
Newsgroups	Deja News *(www.dejanews.com)*	If you love Usenet newsgroups, whether for fun or for tracking the critical buzz on you and your competition, Deja News can help you get more out of them. Besides using its searchable, three-year-old archive of all of Usenet, you can sign up for My Deja News, a Web-based news reader that lets you subscribe to your favorite groups. You'll also get a free e-mail account that will let you avoid spam.
Business	Business Week Online *(www.businessweek.com)*	This fee-based site (which is free for some limited content and $39.95 yearly for an online subscription) is a business hub. It has daily briefings, Web-based e-mail, a travel center powered by TheTrip.com, a career center, hourly radio reports, and (of course) the full text of the magazine each week, including the international edition.
Finance	E*Trade *(www.etrade.com)*	In a subtle distinction from the business category, but an important one, E*Trade is the site for do-it-yourself traders. It gives you not just market moves at $14.95 a trade (minimum deposit: $1,000 for a cash account) but a complete suite of investment tools, including a Personal Market Page, portfolio management, news alerts, mutual fund–screening tools, and more.
Sports	CBS SportsLine *(cbs.sportsline.com)*	This mostly free sports site offers much more for the diehard fan for $4.95 monthly or $39.95 yearly (with a 30-day free trial), including premium content, Your Personal Sports Page for tracking your favorite teams, a sports career center for that dream job, and a member savings club for discounts on merchandise as well as dining and travel.
News	USA Today *(www.usatoday.com)*	Everything you'd expect from America's newspaper—timely news, great photos, and fun factoids—and then some. Its Marketplace section includes travel with Preview Travel, auctions from eBay, business and career opportunities, and more.
The Good Life	Wine Spectator/ Cigar Aficionado Online *(www.winespectator.com or www.cigaraficionado.com)*	Catch up on the latest news and ratings of your favorite cabernets and Coronas. Register and create your own personal wine and humidor lists on the site; you can add your own tasting comments and share them with other users. You can also access all the latest stock market data and sports news.

It is

tomorrow.

Netware 5. Today.

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your business better. It is better.

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company's next beta release. We just didn't
think you had that kind of time.

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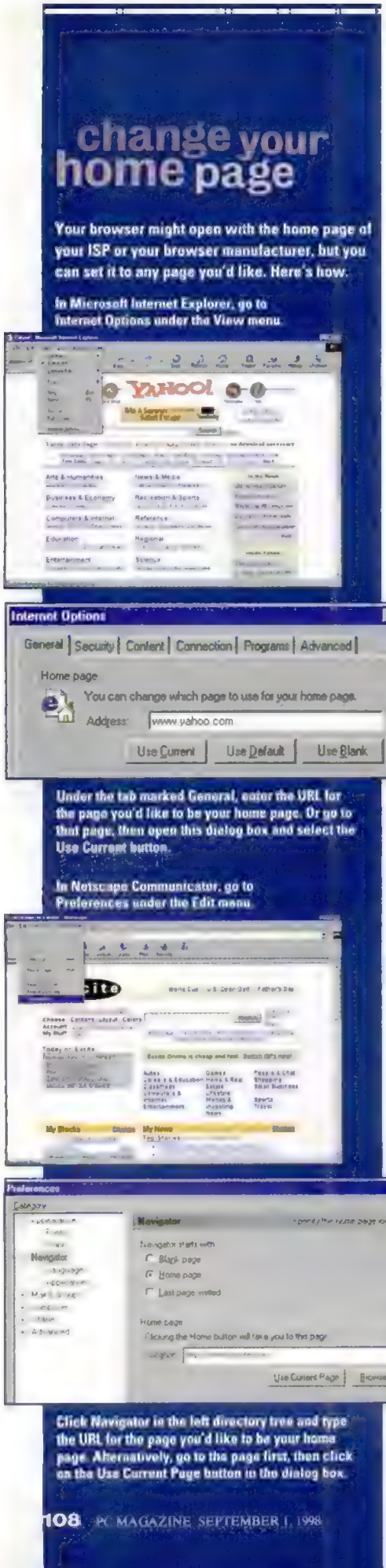
NETWARE 5

the United States and other countries



AOL's message boards are well organized, easy to navigate, and offer a level of discussion far superior to that found in the chat rooms. Postings can be found for almost every topic.

One warning about chat rooms and boards, though: Post a comment or even lurk in a room for a while and you can, and often will, receive unsolicited e-mail. On our tests, we received junk mail to a new account name after spending less than half an hour in a chat room. Although AOL has taken steps to block spam from known bulk e-mailers, unwanted messages still get through.

AOL 4.0, the latest version of the software, goes a long way toward remedying one of the service's most glaring weaknesses: integration with the Web. The user interface now more closely resembles a browser, with back and forward buttons, bookmarks (called *Favorite Places*), and a history of viewed pages (both on the Web and on AOL).

For the first time, both URLs and AOL keywords can be entered in the address bar. AOL's 18 channels and the AOL Today opening screen are always accessible in any AOL area via a navigation bar on the left of the window, resulting in more seamless integration with the Web. Users are whisked to sites as easily as they are taken to AOL-only areas and can go back and forth with ease. But AOL still has a long way to go. You are still in a desktop environment where windows open upon windows, instead of a more browserlike experience in which a new page replaces the previous one.

Directory searching remains woefully inadequate. AOL channels will occasionally link to relevant Web sites and Internet newsgroups, but these links are few and far between. While AltaVista, Excite, Lycos, and Yahoo! all have elaborate indices of Web sites, AOL deposits you at Excite's main search engine.

AOL also lags behind Excite and Yahoo! in the area of personalization. You can create stock portfolios but you can't place them on the welcome screen. You can create news profiles and have stories on subjects you follow delivered directly to your e-mail box, but you can't pick the news source (indeed, there is only one: the Associated Press). You can set reminders but you can't choose when they are activated (you get an e-mail 14 days before the event, and if you desire, a second 4 days before).

AOL's e-mail, while fast and efficient, still lacks the features that even the Web-based clients offer. You have tabbed folders for new, old, and sent mail but you can't create your own folders, so you can't do any sophisticated filtering of incoming messages.

AOL still houses a lot of content in its proprietary format, but more and more, content that once was the exclusive domain of AOL is now available to all Web users as well. AOL can still use its size to get content partners to offer AOL users something special. *Business Week* is free on AOL but subscription-based on the Web, and *The New York Times* lets AOL members search its archives for free, and makes more of the newspaper available than the Web site does.

As Web portals continue to add personalizable content, e-mail, and services like online games, comparison shopping, and classifieds, they are giving AOL users more reason than ever to rethink their membership. But none of the portals can match AOL when it comes to community-based user-to-user interaction.—*AC*

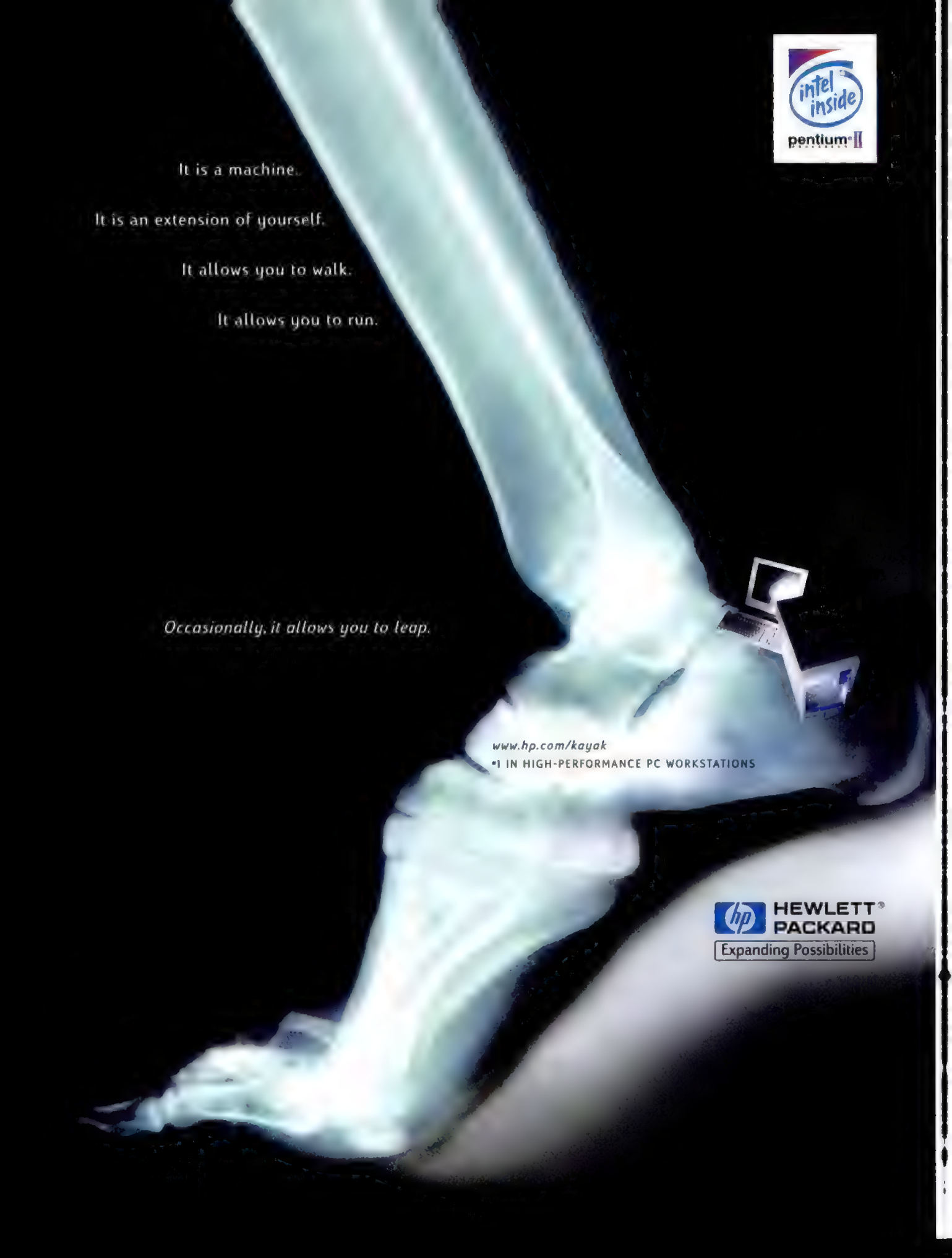
America Online Inc. Price: $21.95 a month. Dulles, VA; 800-827-6364; www.aol.com; *572 at www.pcmag.com/infolink.*

AOL.com

AOL.com is like the Internet version of a cash machine: Users stop by and make a quick transaction when they are unable to get to the bank. In this case, however, the transaction is e-mail, and the bank is America Online. AOL members who visit this site can read and write AOL e-mail in a simple viewer. For millions of users, this means being able to access their AOL mail at the office, on the road, and on any computer that doesn't have AOL software but does have a Web browser.

By the time you read this, AOL.com should be publicly previewing its new site. We got a sneak preview, and it appears that this new beefed-up version is still primarily a way station for AOL members without access to AOL's software—albeit a more complete one.

For now, AOL.com is best suited for members who want to check their mail and log off. To do so requires you to download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pentium II
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It is an extension of yourself.
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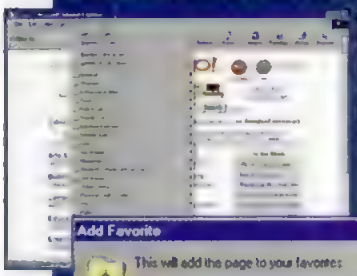
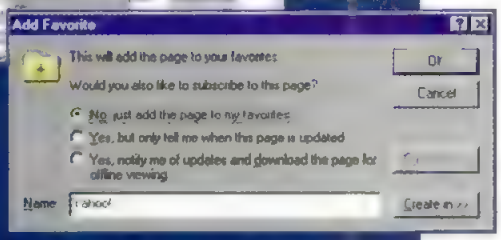
Expanding Possibilities

manage your bookmarks

Web portals aggregate a lot of content in one place for your convenience. You can do that for yourself with the bookmark features in each browser. Here's how to do it.

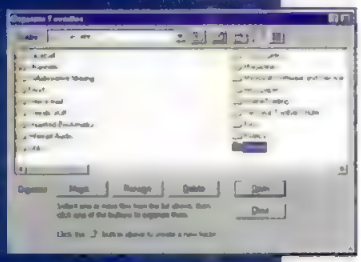


In Microsoft Internet Explorer, when you find a page you'd like to return to, choose Favorites | Add to Favorites.

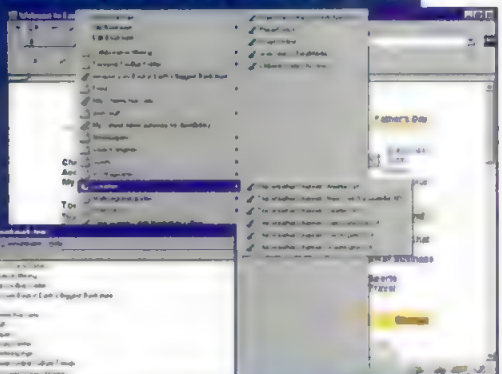


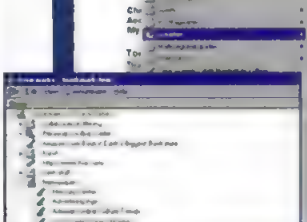
You will then be prompted to indicate where you'd like to put your shortcut to the page.

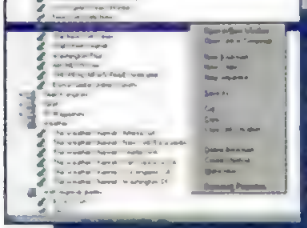
To manage bookmarks in IE, go to Favorites | Organize Favorites. You'll be in a Windows-style folder where you can move, rename, or delete Favorites.



In Netscape Communicator, you can create a bookmark by clicking on the Bookmark toolbar or by going to Window | Bookmarks and selecting Add Bookmark. You can't move a bookmark into a folder when you select it, as you can in IE.

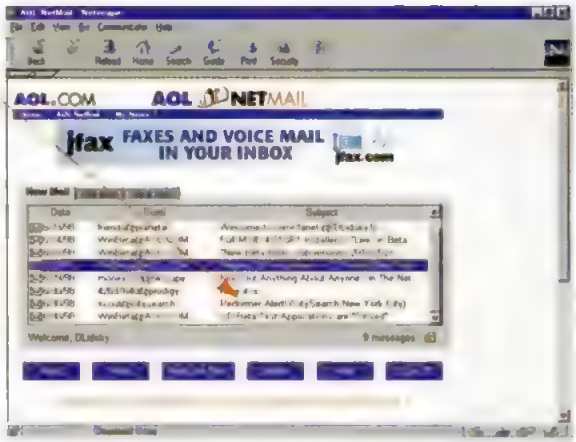






To manage bookmarks in Netscape, select Edit Bookmarks from the same menu. You will then have a tree-like structure from which you can move around and edit bookmarks.

AOL members can check their mail from any Web browser using the NetMail feature at AOL.com.



NetMail, a plug-in or ActiveX control that lets you read and write AOL e-mail. But that's all you can do here. You can't access your AOL address book or attach files. The coming version of AOL.com replaces the NetMail plug-in with a Web-based version. Free e-mail will not be offered to nonmembers, reinforcing the notion that AOL.com is not so much a portal as a home away from home for AOL members.

Indeed, AOL.com doesn't offer much other incentive to come back. Like AltaVista, you can't personalize features, modify the content on the home page, set reminders, or receive the latest headlines from your favorite media sources.

You'll find plenty of ads and teasers for the pay AOL service, and for non-AOL members these may prove a bit frustrating. On the site's 16 channels (covering areas such as Entertainment, Travel, Sports, Computers, and News) are links to a number of AOL-only areas. Click on one of these and you won't be presented with any content but with a suggestion to "give us a try" (complete with a link that lets you download the software). If you're in AOL and using the built-in browser, you'll be notified that you're entering an AOL content area and given a link that opens an AOL page.

The most outstanding section is the Personal Finance section, which contains articles and investment tools as well as built-in collaboration with Quicken. You can't create a personalized portfolio at present, but that is promised for the future. Right now you must type in the stock symbol each time you want a quote. AOL intends to build up its content areas, starting with News, Finance, Computing, Entertainment, Sports, and Travel, leveraging AOL's content partners.

The directory search is a mixed bag, a sort of scaled-down version of AltaVista or Yahoo! but with far fewer sites indexed. You get paragraph-length reviews for some listings, but categories are broad and specific information is hard to pinpoint, a situation compounded by the absence of any capability to search indexed sites by keyword.

Other new features planned for AOL.com include a free home page community and message boards (both initially available only for AOL members) and a larger shopping area. These offerings will make AOL.com more of a general-interest portal, but it is now just a pit stop for AOL members on the go, and even the new site will still favor AOL members.—*AC*

America Online Inc., www.aol.com; *572 at www.pcmag.com/infolink.*

Excite

PC MAGAZINE EDITORS' CHOICE

In a scene out of this year's Belmont Stakes, Excite has come from behind to surpass perennial portal favorite Yahoo! by a nose. Excellent personalization tools, a cool search feature that anticipates what you're looking for, and a well-developed sense of community move Excite into the lead and secure its status as the best portal on the Web—and your best overall bet.

Excite's super integration and variety enhance the experience of creating a customized page. After entering your ZIP code and e-mail address, you already have access to local weather, movie, TV, and sports info. And no other portal lets you add more to a personal page: Excite lets you select stocks to track and create multiple portfolios, and you can include, right on

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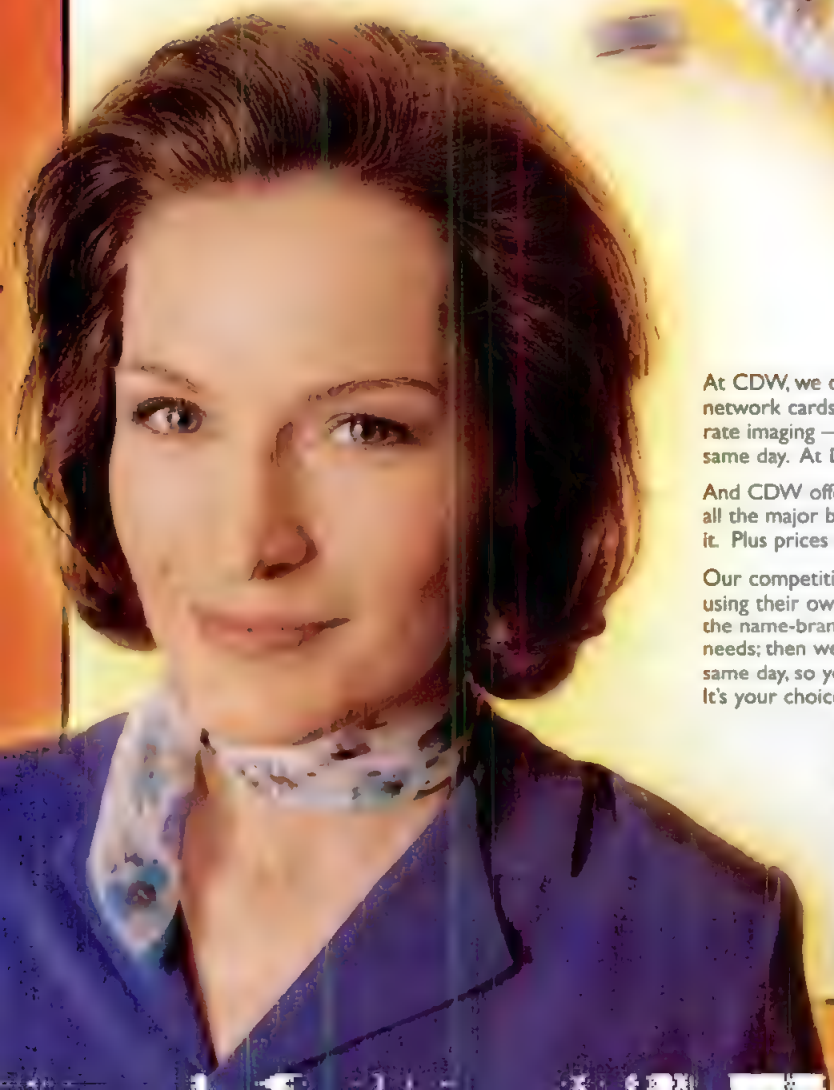

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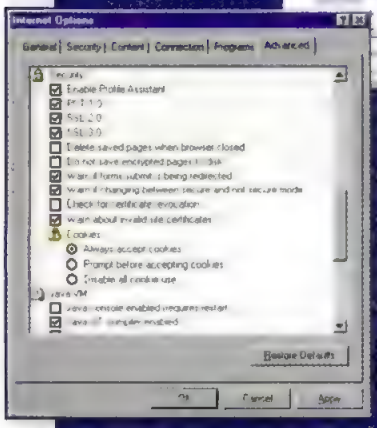
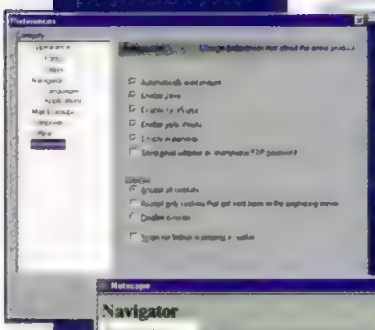
To take advantage of some of the features in Web portals, particularly customization, you will need to let your browser accept cookies. Here's how to do it.

In Microsoft Internet Explorer, go to View | Internet Options. Select the Advanced tab on the dialog box.

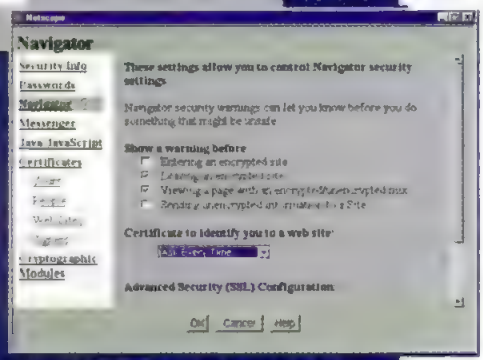


Scroll down to the subhead Security, choose whether to accept cookies, and select the level of security to use when sending encrypted information.

In Netscape Communicator, such choices as what to do with cookies and how to send encrypted information are made in different places.



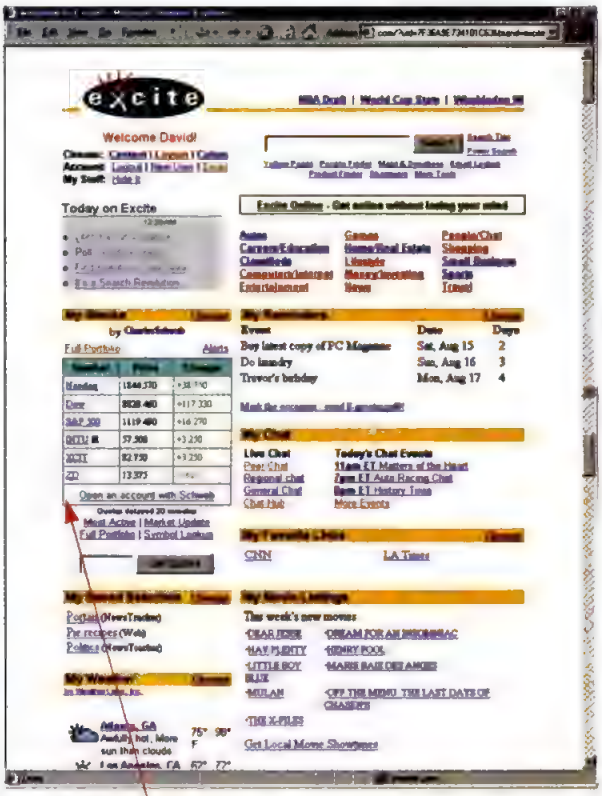
To decide what to do with cookies, go to Edit | Preferences and select Advanced from the directory on the left.



To decide how to be notified when sending encrypted data, go to Window | Security Info and click on Navigator from the menu on the left.

the home page, everything from top news stories to moon-phase statistics to personal reminders. Though Yahoo! does a good job of letting you customize its My Yahoo! pages, you don't get this depth of content or flexibility of placement right on the home page—Excite even lets you customize color and layout.

As Web portals continue to add features as quickly as possible, navigating your way through them often becomes more difficult. Excite doesn't go as far as Planet Direct (which puts a navigational frame around you wherever you go, so you don't get lost), but it's better than its primary competitors in helping you get around. A prominent link back to the Excite home page is always available, and when you go through channels, you get links for each page you've traversed. Contrast this with Yahoo!, which often leaves you feeling stranded when you enter its special sections (such as News, Movies, or Shopping) or use its services (such as mail).



Excite's customizable home page lets you do everything from setting reminders for yourself to tracking your favorite stocks.

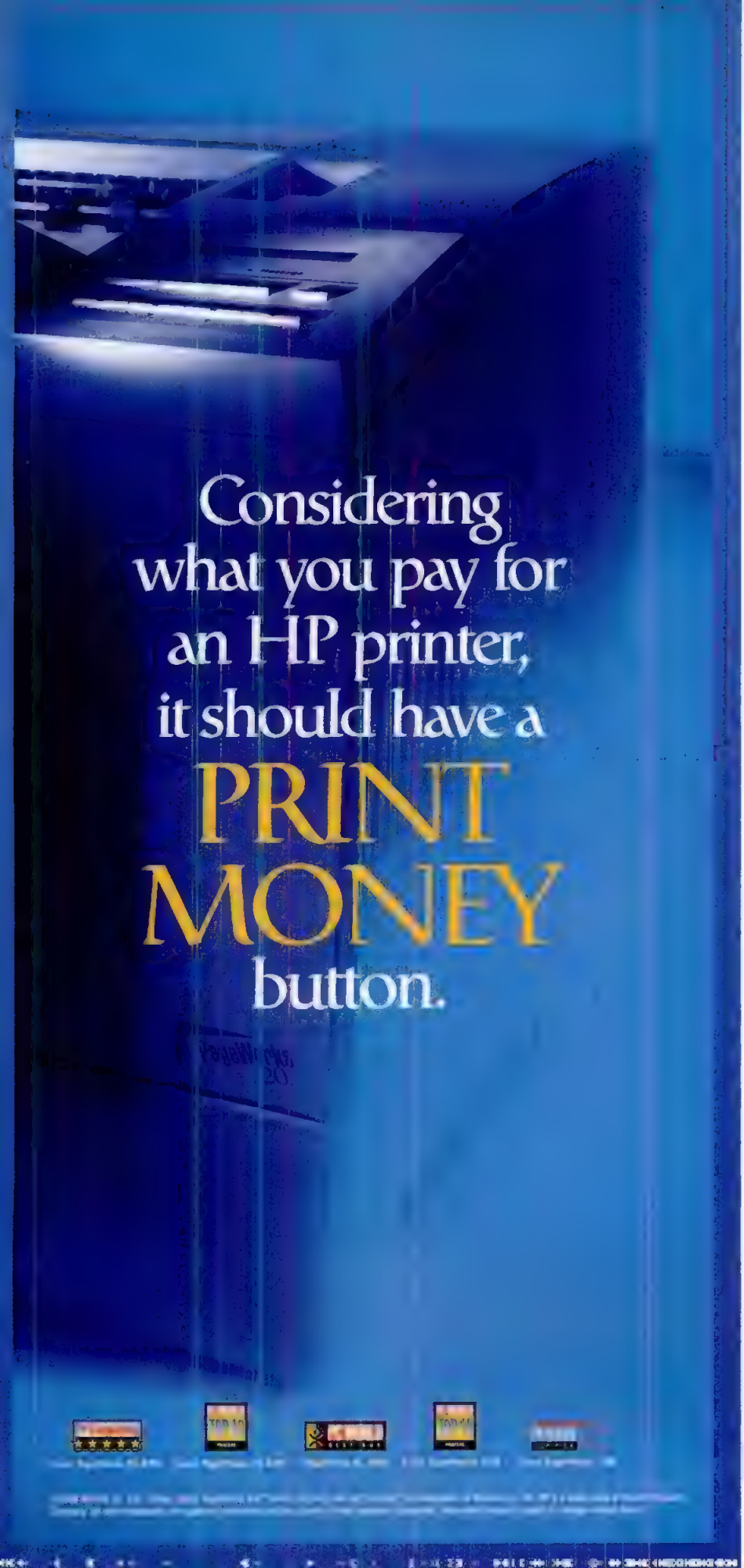
Excite's chat offerings are solid and can hold their own with their first-rate counterparts at AOL. As with chatting in AOL, you can easily look at user profiles and send instant messages. When using Excite's Java-based or ActiveX chat, you can't resize the screen, and it's a pretty standard chat room, but load and install the full chat client and you'll get a completely graphical chat environment. This program includes user avatars, and an instant-messaging feature similar to AOL's Buddy Lists.

General chat, like most chat environments online, tends to devolve pretty quickly into inanity. In the full chat client, many of the avatars are of R- and X-rated images but can be turned off easily. The optional profanity filter available for all chat is easily duped when a user mixes case in the expletives.

Besides general chat rooms, Excite offers several moderated chats a day, ranging from Shakespeare Chat to Hockey Chat to Grandparents Chat. These tend to stick closer to the topics and have slightly higher levels of discourse than in most chat rooms. But while sites like Lycos and Yahoo! offer several live featured chats a week, Excite offers several a day.

Excite also stands out in its message-board areas, and the sheer variety of topics seems to encourage a higher intellectual level here than you typically find in chat (as well as in other message-board areas on sites like Lycos and Yahoo!) It's easy to read and post messages, and a simple option at the bottom of the screen lets you sort through messages based on when they were posted. Also nice is that you can embed both HTML code and links in your postings (there are ready options to help).

How to find the message boards could be made more obvious, however. In the People/Chat area, it's not immediately clear how to get to the message boards:



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You must select a topic in Chat by Interest first. If you pick a main topic, such as Film, you go to a page offering message boards as well as chat. But if you click on a subcategory link underneath Film (such as Favorites), you go directly to the message boards in this area. You will also find links into specific message boards within different channels.

Another standout is Excite's anticipatory keyword searching. It's so good that you often don't need to go to the channels to narrow your search. Even when searching the entire Web, Excite will generally augment hits with extra relevant information. A company search, for example, will pull up stock quotes, a corporate address, a Web site link, and the latest company news. And entering *Braves* pulls up links to the Atlanta Braves team page, a game calendar, stats, links into Excite's channels, and related news stories.

Excite's shopping area could use some improvements, though it does have some nice features. The shopping agent is available both from the shopping home page as well within specific categories—unlike in Lycos, which offers the agent only on the shopping home page, and in Yahoo!, which offers it only within categories.

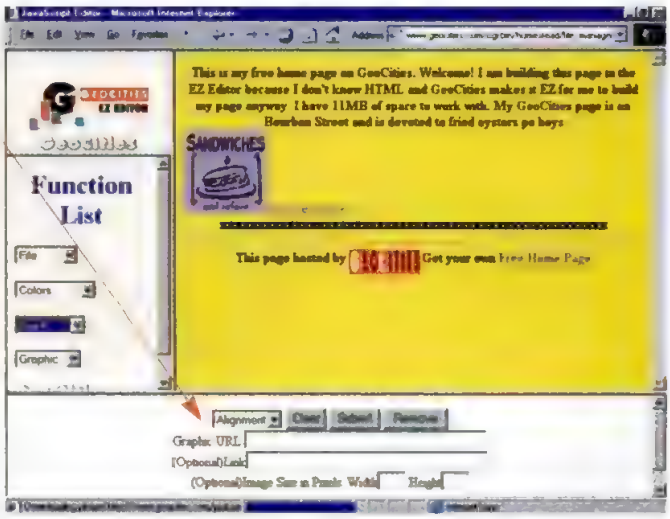
Gaming in Excite is strong, thanks to a deal with Total Entertainment Network, which has supplied the site with parlor games such as spades, hearts, checkers, chess, and various word games. Unlike Lycos games, where player levels are indicated (sometimes confusingly) by numbers (and where you are unable to play should you inadvertently enter the wrong-level room), Excite labels rooms clearly.

With its complete package of a personalized service, compelling chat and message boards, and excellent search, Excite puts together a suite of services that make it the best portal on the Web.—*Jill Léger*

Excite Inc., www.excite.com; *574 at www.pcmag.com/infolink.*

GeoCities

The most successful portals, like Excite and Yahoo!, built a directory infrastructure first and then added content and niche services like free Web pages. GeoCities is working backward, refitting its Web page community for portaldom. Can it be done? We don't know yet, because GeoCities isn't going to be your default home page anytime soon. The problem: There is little to draw you in. A list of 14 categories, covering subjects from Automobiles to Travel, looks promising, but click on one and you'll probably be disappointed. Almost all GeoCities content is user-created home pages—some good, most not. (*PC Magazine*'s parent company, Softbank, is a shareholder of GeoCities).



GeoCities' EZ Editor, one of its three browser-based editors, lets you build a home page without knowing any HTML code.

Free Web pages are, after all, GeoCities' claim to fame. Members, or "homesteaders," as the site calls them, get an impressive 11MB of disk space, which they can use to build their own plots in cyberspace.

GeoCities provides the tools you need: a choice of three Web-based HTML editors or a template-driven page wizard, an FTP client, and an assortment of utilities to help you create and jazz up your site. The tools are not as easy to use as the ones at Tripod in Lycos, but you can also upload files you create in any editor to your site.

GeoCities wants to be more than just a storehouse of personal Web pages. Like the more traditional portals, its goal is to create a self-contained community. But there is a virtual wall around the GeoCities community, with few links to outside Web sites and a Lycos-powered engine that searches only internal pages. That's fine, providing you want to stay in GeoCities once you finish sprucing up your own site.

Alas, it's not likely that you will. The free e-mail is just a GeoCities address that forwards the mail you receive to your ISP, instead of a more full-featured Web-based mail client. Discussion boards are not extensive and are poorly organized, with topic categories too broad and with many messages lacking subject lines.

Chat fares a bit better, with an efficient Java interface that is easy to use and navigate. You'll find a varied selection of chats, but private messages appear in the general chat window, as they do on Yahoo!, though only the sender and recipient can see them. And no user profiles are available, although GeoCities plans to introduce profiles and buddy lists soon.

GeoCities is an okay place to settle down on the Web, but those looking to explore should head elsewhere.—*AC*

GeoCities, www.geocities.com; *575 at www.pcmag.com/infolink.*

Infoseek

Really still just a search engine, Infoseek is a bare-bones portal, lacking e-mail, message boards, and customization features. And an absent sense of community ensures that even regular users will feel like eternal visitors, a situation Infoseek's recent purchase of the WebChat Broadcasting System Web community (WBS) does little to remedy. Infoseek does offer some strong business-related tools that are worth a look, such as an industry tracker. And Disney has bought a significant interest, spurring the development of a new service scheduled to launch later this year. But for now, unless business is your passion, don't bother until you hear that Infoseek's new service is available.

Infoseek's greatest strength is its news and business-related information. Industry Watch (powered by NewsReal), found on the Business channel, lets you follow industry news in 20 major markets such as banking and computers. Though you can't narrow the categories, you do get solid information from high-quality sources. Search on a company and get news, a corporate overview, and business intelligence information such as a list of

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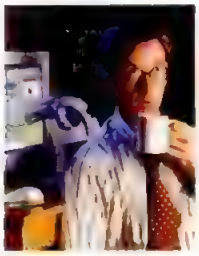

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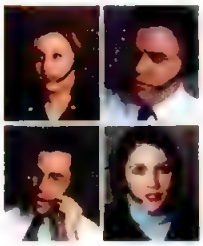

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Micron	56%	47%	43%	9%
Gateway	54%	48%	45%	10%
Dell	54%	43%	49%	10%
IBM	41%	33%	36%	15%
Compaq	37%	30%	30%	17%
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--- "Service and Reliability Survey," *PC Magazine*, July 1998
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- 64MB SDRAM Memory / 512KB Secondary Cache
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- Intel740™ AGP Graphics with 8MB SDRAM
- 17" Digital Monitor w/OSD and NEC CromaClear CRT (16.0" viewable, 25 dp, 1600x1200 max. resolution)
- Choice of Intel Pro 100 Ethernet Controller with Wake-On-LAN™ Technology or K56flex protocol Fax/Modem*
- 32X Max EIDE CD-ROM Drive
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows NT 4.0 Workstation
- MS Office '97 Small Business Edition
  Upgrade to MS Office '97 Professional for $199
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- 24-hr./7-day Technical Support
- QSentry Technology (including Intel LANDesk Client Manager V 3.1)

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QP6/333 SB-3 (w/ Pentium® II Processor). .$1649
QP6/400 SB-3 (w/ Pentium® II Processor). .$1999

QP6/400 SB-4 $2199

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- 3D Labs Permedia 2 AGP Graphics Card with 8MB SGRAM
- 19" Monitor w/OSD (18.1" viewable) 1600x1200 .26dp
- Choice of Intel Pro 100 Ethernet Controller with Wake-On-LAN™ Technology or K56flex protocol Fax/Modem*
- 32X Max EIDE CD-ROM Drive
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows NT 4.0 Workstation
- MS Office '97 Small Business Edition
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- 32X Max EIDE CD-ROM Drive
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- Altec-Lansing ACS-45 Speakers with subwoofer
- Quantex ATX Mid Tower Case
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- MS Windows 98
- Power Multimedia Software Bundle
- Microsoft Office '97 Small Business Edition
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- 19" Monitor w/OSD (18.1" viewable) 1600x1200 .26dp
- Internal 100MB Zip Drive with one cartridge
- K56flex PCI Fax/Modem* w/Voice Mail and Speakerphone
- 2nd Generation DVD-ROM Drive
- SoundBlaster AudioPCI 64V Wavetable 3D Sound
- Altec-Lansing ACS-490 Dolby Surround Speakers with subwoofer
- Quantex ATX Mid Tower Case
- MS Natural Keyboard Elite with MS IntelliMouse
- MS Windows 98
- Power Multimedia Software Bundle
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- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports
- Integrated Personal Touchpad
- MS Windows 98 or Windows NT Workstation 4.0
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- 512KB Secondary Cache
- 4GB Ultra-ATA HD / 3.5" 1.44MB Modular Floppy Drive
- PCMCIA K56flex protocol Fax/Modem*
- 24X Modular CD ROM Drive
- PCI Bus with 128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- 2nd Lithium Ion Battery
- Mini-Docking Station
- USB and Fast IR Ports
- Integrated Personal Touchpad
- MS Windows 98 or Windows NT Workstation 4.0
- MS Office '97 Small Business Edition
- Carrying Case
- 3-year limited warranty on CPU and Main Memory
- 1 year parts and labor limited warranty on all other components
- *Add a Deluxe Carrying Case for only $99*
- *Add a PCMCIA NIC for only $129*
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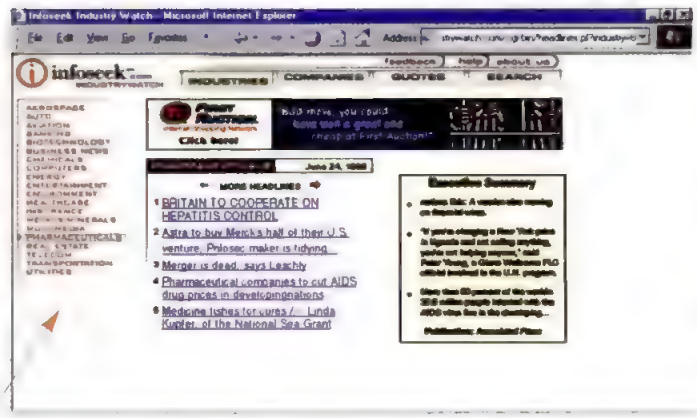
key competitors.

The personalized news option lets you type in specific topics using keywords within eight categories such as Computer News and Political News. The option is well integrated into the service in some ways—you can access personalized news in each of the related channels.



Infoseek Industry Watch helps you keep up with the latest goings on in your industry of choice.

But after you sift through your returns, you see that you can now search on your keywords against Infoseek's news Web sites, its national news, or its entire Web database. You are never given the option to search more than wire services until you reach this point. And none of this is connected to Industry Watch. In the end, you're better off using the superior Excite NewsTracker, which searches hundreds of major Web news sources by default and learns what you like over time.

Infoseek's current efforts to become a portal are best represented by its new chat and home page community, WBS. Chat is powered by browser-based software that is decidedly non-intuitive. Although we found the chat varied and lively once we figured it out, the interface is a big hurdle to overcome. It seems more like a live message-board thread than a chat room. If you're in "frills" mode where you can augment your comments with photos, you can't easily follow a chat and participate, because it takes a while for everything to load.

WBS also offers free Web-page building. Creating a page in WBS—you're given 7MB to work with—is simple, particularly if you use the featured page builder, Web Architect. You don't need to know any HTML, and you do your work in a JavaScript-driven editor much like the one in GeoCities, except a bit better designed. You can choose from eight layout templates, for example.

Disney's revamping of Infoseek is expected to draw on the wealth of Web content that Disney owns—including ABC.com, ABCNews.com, ESPN.com, and Disney's sites, as well as the design expertise of Starwave, which has built some of the best sites on the Net. But again, unless you're a business junkie, you may as well wait for the relaunch.—*JL*

Infoseek Corp., www.infoseek.com; *576 at www.pcmag.com/infolink.*

Lycos

If you want to make friends on the Internet, no portal offers you more opportunities than Lycos, from its chat and gaming features to its free Tripod Web-page community. The Lycos community is a vast and varied body, prodigious enough to improve the odds that you'll discover a kindred spirit online. Unfortunately, the site is hindered by a number of quirks and inconsistencies that make navigation difficult and could frustrate users. These shortcomings place Lycos below the ranks of AOL, Excite, and Yahoo!.

The lack of integration is a serious problem. You can go directly to Tripod from the home page or find directed links in Lycos's channels, called Web Guides. But once you get to Tripod, it's an immersive experience; you've really left Lycos behind, but you can still search the Web.

Poor integration also figures in Lycos's implementation of its WiseWire technology, which lets users rate sites on the Web within a particular category. You can go to a site and vote within a navigational frame at the top of the screen, thereby shaping the site and influencing the decisions of others.

But first you have to figure out what's going on. You can find this content only in the specific community guides within the Web Guides; it's not integrated with Lycos's Top 5% Web site reviews, search results, or Tripod "pods" (user groups). And when you enter an area, it's not readily apparent that the rankings beside each site represent user opinion and that you can be a part of that.

Customization is a simple affair that results in a personalized selection of news stories, sports scores, stock prices (which are accompanied by links to related news, information, and chat), and horoscope, weather, and state lotto information. Customization is limited to the Lycos Personal Guide and isn't integrated across the site as it is in Excite. It's also quirky. Six states and the District of Columbia were missing from the list of states used to indicate which state-related news (if any) you want on your personalized page.

The Boggle-like Tangleword is one of the many fun and popular games you'll find in Lycos Games.

Lycos chat is a pretty standard affair. Its integration of profiles, instant messaging, and chat-room navigation is a bit clunkier than that of AOL and Excite.

Though Lycos message boards span a wide range of subjects, following a given thread can be difficult. After opening an original message, you must click separate-

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The HP PhotoSmart photo scanner & photo printer let you print amazingly crisp, clear pictures at home. No waiting in line or wondering if the clerk will reprint frame 24 instead of 24A. To start, the 30-bit scanner happily scans slides and negatives at 2400 dpi and photos at 300 dpi. It then zips them into your PC where you can repair old photos, add text or special effects, even remove that mildly unnerving red eye. Next, at the push of a button, the printer produces sharp, vibrant images that look and feel like real photos. Speaking of which, the HP PhotoSmart system can handle a variety of paper sizes and finishes, and produces enlargements and reprints in just minutes. You also get Microsoft® Picture It!™ photo-enhancing software.

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ly on each reply, which in turn becomes a part of the larger message you're reading. Repeatedly scrolling down to click Next can become tedious, especially when you realize that replies to replies come up in different places than replies to original articles. The Excite approach, which lets you read six posts at once, is more efficient.

But while Lycos's chat and message-board clients are of average quality, they are presented within an above-average framework designed to promote a rich sense of community. The site regularly hosts live chats, the transcripts of which can later be pulled right from the chat start page. And there are also regular weekly events: a trivia game every Monday night and sports talk every Wednesday night, for example.

In the games area, too, Lycos does an impressive job of fostering connections among visitors. Its excellent offerings—powered by Go2Net and including backgammon, chess, checkers, and Tangleword, a Boggle-like word game—are augmented by a chat client that lets players chat between rounds. Lycos hosts about six or seven tournaments a day. Though these are similar to the offerings at Excite and Yahoo!, we had more fun here.

The Tripod home-page-building service is a fine offering, too, that lets even the novice user easily create a customized home page, complete with text and images. Tripod also makes it easy to browse the handiwork of the 1.5 million Tripod members.

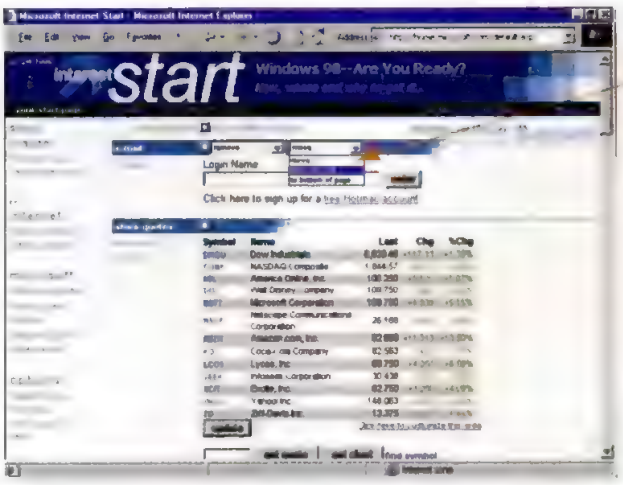
A search feature in Lycos lets you easily search the Internet for pictures and sounds, putting just a few clicks between you and that treasured Alan Greenspan photograph or Burns and Allen comedy routine. This is the best-implemented version of this feature on the Web.

Lycos is on its way to building a significant Web community. The site lacks some of the polish of Excite and Yahoo!, but its tools and technology are generally impressive.—*JL*

Lycos Inc., www.lycos.com; *577 at www.pcmag.com/infolink.*

MSN Internet Start

With its Internet Start site, Microsoft has just that: a great start. If you use the company's IE4 browser, the slick home page can be customized with greater ease and in greater depth than any other Web portal front page we looked at, even Excite. Unfortunately, the personalization—and this site's advantage over the competition—ends there. Without any chat, instant messaging, message boards, or free Web pages, Start offers no real sense of community, making it weaker than AOL, Excite, and Yahoo! Microsoft is expected to improve this site by the end of the year, making it more full-featured.



MSN Internet Start is easily customizable—particularly if you use Internet Explorer 4.0.

One of Start's best features is its free e-mail from Microsoft's subsidiary, Hotmail. We found Hotmail to be superior to the offerings found at Yahoo! Mail and MailExcite. It has filters, block lists, spell-checking, and HTML compatibility. But all Start provides at present is a log-on box into Hotmail, so you don't get e-mail notification from the home page as you can with your My Yahoo! page.

You can customize the content you want on the home page, including news, business, stock quotes, computers and the Internet, travel, home and family, sports entertainment, and even news video clips. The variety and quality of brand-name content providers gives Start an edge over any other personalized home page. Your options include, among many others, CNET, MSNBC, MTV, *The New York Times*, People Online, *The Wall Street Journal* and ZDNet.

How you customize the home page differs, depending on your browser. Using IE4, you get the full experience (surprise, surprise). For example, you cannot change the order of the categories as they appear on the page except by using IE4. You can open simple drop-down boxes right from the home page to add and remove content and alter the placement of the section on the fly. It's a slick, seamless way to modify your home page in a flash, based on what interests you at the moment.

When you're using any other browser, Start lets you set all preferences from a single page off the home page, making configuration a painless procedure. This is better than the approach of My Yahoo!, where you have to click through many screens to select the content you want. You can access this page using IE4 too, but the look and feel outside IE4 is less polished.

At present, there's not much else to Start. Directory search is a big disappointment. Categories are too broad, meaning you have to sift through every filmmaking site to find anything on screenwriting, for example. Worse, there is a limited selection of sites listed, and the ranking can be confusing. For example, the top sites are listed first, and subsequent pages list sites alphabetically. You can't search within categories either. Instead, you must search the Web as a whole.

Much of the revamping of the site should be in place by the end of this year. Essentially, Microsoft already possesses many of the features found at the best portals, such as online shopping services (Expedia and CarPoint), online finance (Investor), and local information (Sidewalk). It's just a matter of integrating those features. Free chat, message boards, and personal Web pages all are likely to be added to the site.

Indeed, as it is now, Start does not offer users much reason to stick around. But the site does get you started on the Web in a very effective way.—*AC*

Microsoft Corp., home.microsoft.com; *578 at www.pcmag.com/infolink.*

Netcenter

Picture the spectacle of something straight and cerebral going mainstream with the hope of engendering mass appeal. Netscape's Netcenter, Version 2.0, is in the

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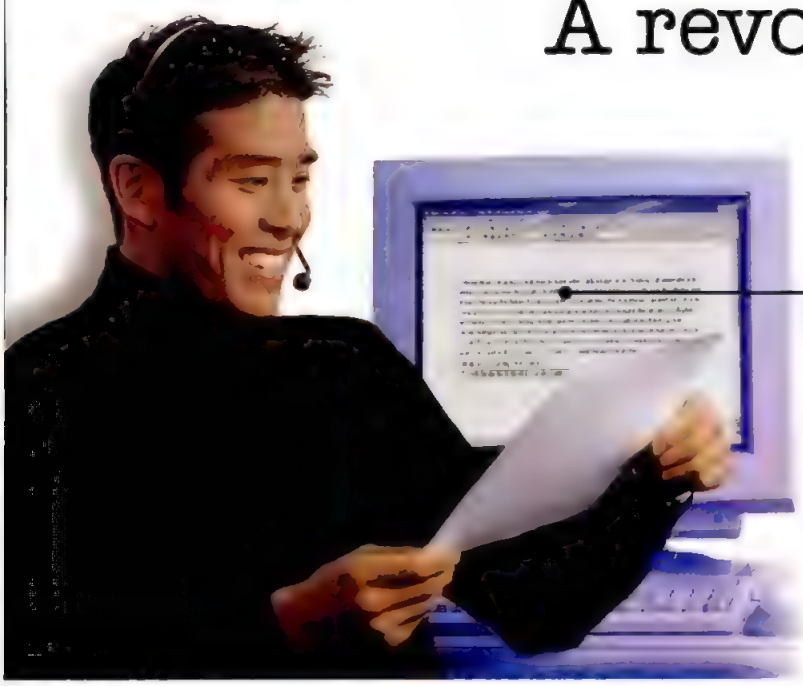

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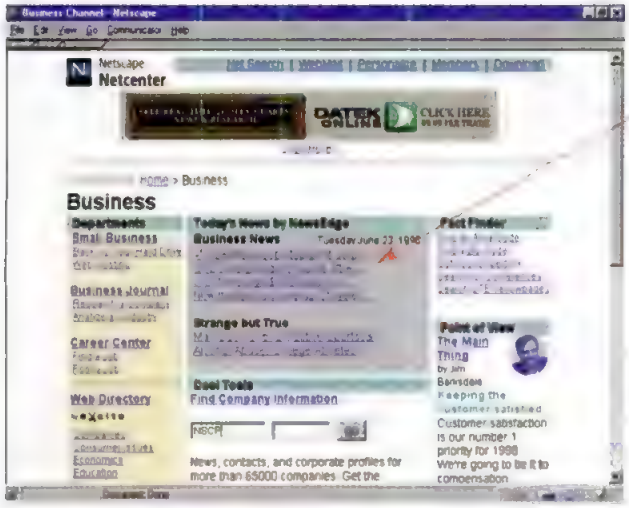

Netcenter's strongest area is its business center, with news, tools, and company data.

process of this awkward transition. The portal's original incarnation as a serious business site, with business-oriented content as its tasteful centerpiece, is being transformed. Its designers—scrambling in the hot portal market—are attempting to make Netcenter more marketable to the millions of people using Netscape browsers to access the Net. Whether Netscape will be successful at moving the portal out of its niche is still undetermined. In the meantime, the new interface represents a strange hybrid of business hub and consumer service.

At the core of Netcenter, still alive and well, is a message-board area called Professional Connections. Fueling some 400 discussions on any given day are interviews with industry notables—events the site regularly hosts—which continue to generate idea exchanges well after the events have transpired.

Other discussions are started by hosts, who typically pitch starter questions and then interject with postings to keep discussions alive and on track. Following the various threads is simple, but be prepared to scroll. Though the software isn't as user-friendly as that of Excite's, the content is top-notch.

Supporting this sense of community is Netcenter's easily accessible Member Directory. Once you fill out a profile and join the ranks, you can easily look up member profiles—searching by name, e-mail address, or interest. Also enhancing member communication is Netcenter's instant messaging provider, AOL Instant Messenger (AIM)—the best of the IM clients we tested.

Building on the communication offerings, Netcenter's free e-mail client, Netscape WebMail, offers automatic message filtering, multiple folders, and access to up to seven POP mailboxes. It's the best free-mail client available.

Yahoo! must be flattered that its interface has been so faithfully copied by Netscape. Netcenter features 16 channels in the customary categories (such as Autos and Lifestyles), as well as quick links to ABCNews.com headlines and Netcenter events. The mix of the serious and the frivolous seems particularly awkward; a site with a corporate focus shouldn't need a games channel.

Customization in Netcenter is limited at present. If you sign up for NewsEdge's Business Journal, you can create My News, a section of customized news stories. Note, however, that before you sign up, you get no indication that Business Journal costs $6.95 a month after a month's trial. We recommend using Excite's NewsTracker and saving yourself the expense.

Personalized news is also offered through In-Box Direct, a service kept on from the old days that lets you choose electronic versions of print periodicals and online publications for e-mail delivery. The expansive list of offerings includes CNNfn, Mr. Showbiz Gazette, and *The New York Times*. Hotmail and Yahoo! Mail also have services like this, but Netscape's was the first and remains the best.

In the coming months, look for more razzle-dazzle in the new Netcenter, including remote Web bookmark management, an address book, and better search integration with the Netscape browser.

With its current suite of communication tools and given the ones planned, Netcenter may very well continue to be a portal

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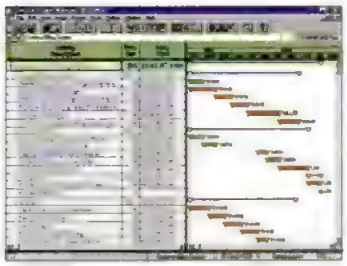

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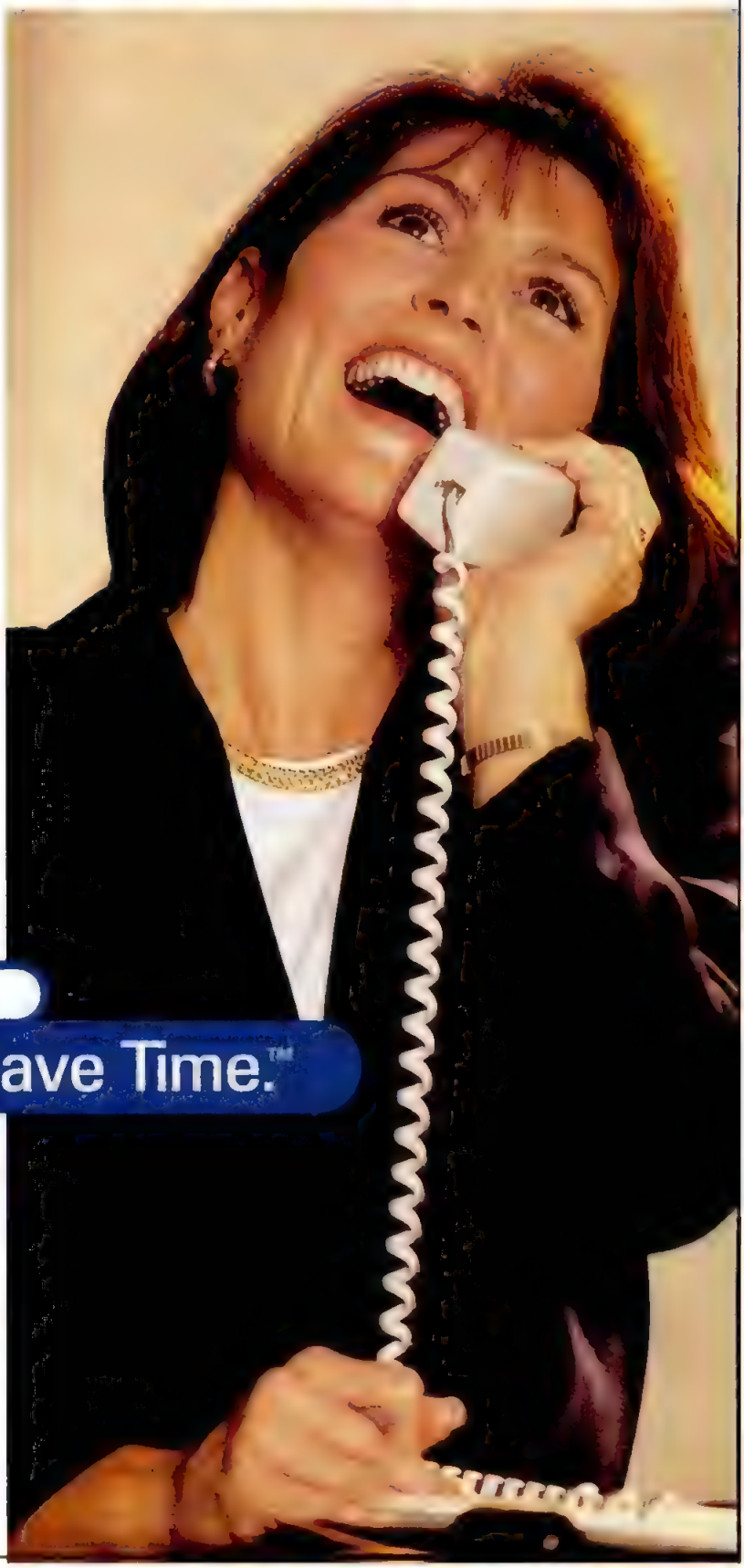

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with a strong focus on business.—*JL*

Netscape Communications Corp., home.netscape.com; *580 at www.pcmag.com/infolink.*

Planet Direct

In terms of concept, Planet Direct stands out from the crowd with its homey, friendly look and feel. The site's execution needs to be improved before reaching the top tier of Web portals such as AOL, Excite, and Yahoo! The discussion boards are sparse, instant messaging awkward, and chat almost nonexistent. And although the home page is configurable, the site needs more content to make this your starting point on the Web. Yet Planet Direct is an inviting site that, for all its flaws, holds a great deal of potential.

Make no mistake, the site has a long way to go. Take the home page. After you register, it welcomes you by name (noting when it is morning and evening). Graphically, the page is one of the more impressive in this roundup. But customization choices are odd: You can add up to five custom links—a handy feature—but you cannot choose which news sources to see. Planet Direct displays one to two headlines from Reuters, which is the only provider of late-breaking general news. The site uses your ZIP code to display the local weather and lets you select the order of channels, but these features are not enough to make the page your first choice.

An internal page called the Info Center is also configurable, letting you add such items as a virtual address book and personal calendar (from PlanetAll) and TV listings. All the Info Center provides are links to other pages that actually display the information. A list of stocks can be tracked here, and news headlines are more extensive (though again, only from Reuters). But all this content would be better positioned on the home page.

Planet Direct does have some notable touches. It remembers where you are, so Yellow Pages searches, by default, look for businesses in your neighborhood, just like those in Yahoo! And when you call up the Food and Drink channel, the site lists links to local restaurant information.

Navigation, too, is well done, particularly for novices. No matter where you go, you remain tethered to Planet Direct by virtue of a navigational frame. This feature has a comforting, AOL-like feel to it. The one exception we found was the enticing Personal News link in the Info Center: When we clicked on it, the link confusingly prompted us for a password to the NewsPage service from NewsEdge as if we had already signed up.

So far, Planet Direct has been rather unsuccessful in its attempts to build a community of users. Chat rooms, for example, are few and poorly attended. Little wonder: The chat interface is rudimentary and clunky. Instant messaging is more like instant paging. The form-based messaging limits you to 128 characters, so verbose friends will be cut off mid-sentence. Worse, you can't send instant messages and surf through Planet Direct at the same time.

Planet Direct prevents you from getting lost by keeping a navigational frame with you wherever you go.

Unlike major portals, Planet Direct does not offer free e-mail. Instead, an e-mail viewer lets you retrieve mail from a POP server and send off responses. This is a convenient feature, but users are likely to want a complete free-mail package such as Hotmail or Yahoo! Mail.

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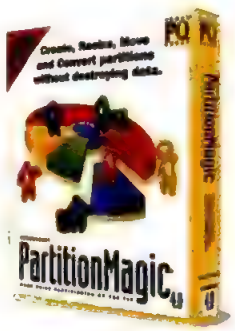

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POWER PQ QUEST

Planet Direct has its work cut out. Right now, any of the major portals such as Excite, Lycos, and Yahoo! are better places to start one's journey on the Web.—*AC*

CMG Information Services Inc., www.planetdirect.com; *580 at www.pcmag.com/infolink.*

Snap!

A simple, lightweight portal that clearly wants to be more, Snap! has some good ideas, but they tend to be half-executed. Building and expanding special areas such as Top Stories, My Local Center, and One-Stop Shops is a smart move; the areas are all lacking in some way, however, especially when compared with similar offerings on Excite or Yahoo! CNET now jointly runs Snap! with NBC, but in our tests, no changes in the service were evident. Though Snap! has made a deal with iName for free e-mail, that feature wasn't yet live when we tested. Also missing were instant messaging, message boards, and any real depth within categories.

Snap! offers a clean and straightforward Yahoo!-like interface. It's easy to access local weather, lottery, movie, and Yellow Pages information once you have entered your ZIP code at the top of the start page. You also get quick links to the Employment and Personals listings of its Classifieds area (serviced by Classifieds 2000), which are set to search in your area. But go directly to My Local Center and search its categories such as Businesses & Services or Dining Out, and you'll see that, though inspired in concept, My Local Center could stand having its databases fleshed out: The Dining Out section for Washington, D.C., for example, offered a direct link to just one restaurant and listed only one Web site (a beer guide); clicking on Guides, however, pulled up a whopping three more links.

Top Stories is a relatively strong offering, assembling links from major news sources and related sites on a few big events. This is a great feature, but Yahoo! has the same offering, called Full Coverage, which covers hundreds of current events in six categories and does a more thorough job, in a neater interface.

Despite the array of categories (including Arts & Humanities and Entertainment), they are often pretty thin, and the catalogued sites are random at best. Searching the Entertainment category on "Ally McBeal," for example, pulled up 25 Baby Cha-Cha sites before listing any sites directly pertaining to the show itself. A comparable intradirectory search in Yahoo! yielded better-quality hits nearer to the top.

Also of note: The Shopping category is divided between an up-top list of One-Stop Shops (direct links) in a handful of categories and a more expansive list of categories down below, each of which leads to a host of related vendor sites. Snap! deserves kudos for clearly labeling when you're getting sent to one site and not to a list of links in that category.

Beware, however, of the ubiquitous Deal Finder shopping agent, powered by Junglee. Using it to find the video *Broadcast News,* for example, pulled up a lone hit of $9.49; Snap!'s One-Stop Shop, Reel.com, offered the video for $8.99. And when One-Stop Shop Music Boulevard listed the "Ally McBeal" soundtrack for $13.94, Deal Finder found it for $15.85. A few days later, the cheapest deal on Deal Finder was $16.69 for the CD, but the service found the video for $8.48.

Snap!'s My Local Center links you to local resources—although they can be a bit sparse.

Snap! Chat is easy to use and nifty in that you can easily choose up to five chat

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personalities, and you are notified whenever someone enters and exits a room. Although you can choose among a variety of chat areas (Entertainment, Health, News, Shopping—also directly accessible from the pertinent Snap! channels), more than a few tend to be sparsely populated—even the romance area.

NBC's investment in Snap! means you'll soon be hearing as much about Snap! as you do about "Suddenly Susan." But unlike certain sitcoms, perhaps the site will get a content infusion as well as a promotional boost.—*JL*

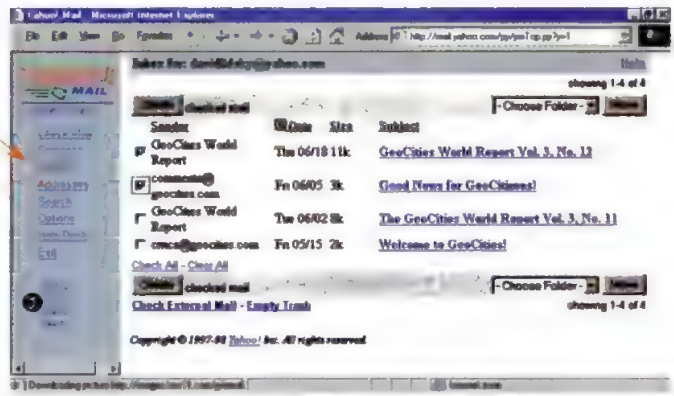
CNET Inc., www.snap.com; *581 at www.pcmag.com/infolink.*

Yahoo!

With its unparalleled directory search and excellent news and finance tools, Yahoo! is clearly one of the premier Web portals. In addition, My Yahoo! is a great personalization site within a site, but Excite better integrates personalization across its site. Yahoo's chat and message boards are always well populated, but Excite and AOL have better tools to foster community; Yahoo!'s chat software and message boards are not as easy to use. Yahoo! could also improve some of its navigation and the integration of its minisites and directory. The Web portals race never ends, but at this signpost, Excite beats Yahoo! (*PC Magazine*'s parent company, Softbank, is a shareholder of Yahoo! Inc.)

Register once and you will be signed up for all of Yahoo!'s services, including chat, e-mail, and classifieds. Using your stored ZIP code, Yahoo! can find local movie theaters as well as Yellow Pages and mapping information. This helps create a more seamless experience than that which we found at other portals such as Lycos, where you have to register and sign in separately for e-mail, chat, and home-page building. Yahoo!, by contrast, will even transfer some of your basic information to GeoCities when you sign up for a free Web page.

Good luck finding where to sign up for a GeoCities page, though. Yahoo! has so many features and sections that you often stumble on them completely by happenstance. Whereas Infoseek and Lycos promote their free Web page services from the home page, we found the GeoCities offer as a simple link when we decided to edit our Yahoo! profile.



Yahoo! Mail is one of the best of the Web-based free e-mail clients: It's easy to use, easy to access, and ad-free.

We found other notable services—a competitor to Netcenter's In-Box Direct e-mail delivery service, a reminder feature, and a neat remote Yahoo! search console—all completely by accident, many levels deep in the site and promoted humbly. Yes, Yahoo! has so many features that it can do that, but finding the services that make Yahoo! special should not be like finding Atlantis. AOL, Excite, and Lycos all fall victim to this problem to varying degrees, but we found it worst with Yahoo!

My Yahoo! is a series of personalized pages that are far more elaborate than other "My" pages. It is broken down into 12 sections, including Front Page, Health, News, Travel, and Computers, each of which can be independently configured. In effect, you are customizing an entire site, not just one page. For each section you choose the types of content (*modules*) you wish to include, and you select where they should appear on the page.

A wealth of modules is available, including music album releases, favorite bookmarks, horoscopes, weather, upcoming Net events and chats, technology headlines, stock portfolios, business news, and the latest posts from your favorite Yahoo! message boards. Putting all this

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customized material in one place gives users an incentive to make My Yahoo! their default page.

Yahoo! Mail goes further than any other free-mail account in integrating mail into the site—unlike Start and AltaVista, where e-mail is almost completely separate from the rest of the site. You can see whether you have new messages from any My Yahoo! page, and you have links into your mail from many places within the site. Yahoo! Mail is not as aesthetically pleasing as Hotmail and can't read HTML mail, but it is ad-free and has all the essential features, including filters, search capability, and the ability to retrieve external mail from your POP3 accounts. Yahoo! Pager, the instant messaging client, also provides e-mail notification.

The integration of the directory, the Yahoo! minisites such as Yahoo! Finance, and your My Yahoo! info is not complete. Should you decide to create a stock portfolio on the My Yahoo! finance page, the page automatically generates news headlines for each company you're following. But go to the Yahoo! Finance site and all you get is a link back to your My Yahoo! page. Excite not only integrates company news with the companies in your portfolio but also integrates your personal portfolio into its money and investing section.

We found some kinks that prevent Yahoo! from being a truly interactive community of users. You have an extensive array of chat rooms from which to choose, but the interface is clunky. For example, you get a list of all users in a chat room, but you cannot click on a name to bring up a profile. Instead, you must scan a list of all users (thousands) in all chat rooms and then click on the user you seek.

The message boards are very popular and have quite a variety of available topics, but again, the software could be better. You can look at only one post at a time, as opposed to a just-right six at Excite. This makes following a thread more difficult than it should be.

Yahoo! has many great services and features, but their integration into its directory and across the site needs improvement. Yahoo! is certainly a destination site for particular things, but it's not the total package. —*AC*

Yahoo! Inc., www.yahoo.com; *582 at www.pcmag.com/infolink.* PC

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how to choose an ISP

If the thought of choosing an Internet service provider (ISP) or of switching to a new one fills you with dread, don't worry—you aren't alone. As more and more ISPs crop up and the options gets increasingly complicated, not to mention competitive, the supposedly simple task of getting on the Internet takes on a new dimension. Follow this guide to avoid any pitfalls and to find out what you need. Arm yourself with these basic questions and information on national ISPs, designed to set you firmly on the path to successful surfing.

PRICE Probably the first thing you'll want to know is how much it will cost. Ask the provider about a free or low-cost trial offer for the first month, to give you an opportunity to try out the service. Most providers now offer a fixed, flat-rate monthly price with unlimited online time. But if you are interested in checking only for e-mail and surfing for brief periods, look for pricing that reflects actual time spent online (as low as $7 a month for 5 hours). Also ask if there are any start-up fees in addition to the monthly costs.

Be wary of prepayment discounts, unless the contract has an escape clause. New companies often offer these contracts to raise working capital. You might get stuck with a service that doesn't meet your needs, and if the company folds, your money is likely gone.

ACCESS Make sure that the ISP offers an 800 number or a POP (point of presence) in your calling area. Ask up front if there is an extra charge for using the 800 number. If you travel a lot, you will want your ISP to have numbers around the country in the areas where you expect to be. Try calling the number a few times around the time of day you'll be going online to see how often you get a busy signal. If you don't get the ear-splitting shriek of a

national ISPs: tale of the tape

See what the national ISPs offer to help you decide which way to go, either with one of these providers or with a competitive local ISP.

	America Online	AT&T WorldNet	Concentric Network	EarthLink Sprint Total Access	IBM Internet Connection
Basic information	Download the software off www.aol.com or order by phone (800-827-6364). It has an integrated browser, a version of Netscape, and a copy of IE.	Download software from the Web site (www.att.net) or order by phone (800-967-5363). Choose Internet Explorer or Netscape as your browser.	Download the software (www.concentric.com) or call 800-939-4262 for startup software. Comes with IE, but Netscape is available on request.	Download the software from www.earthlink.com or www.earthlink.net and save the $25 setup fee, or call 800-395-8425. You can choose IE or Netscape.	Download the software you need to get started (www.ibm.net) or call 800-455-5056. Comes with both IE and Netscape.
Service offerings	A trial offer of 50 free hours can be downloaded from the site, which automatically rolls over to the unlimited-access plan at $21.95/month when the 50 hours is reached. A lite plan, which allows 3 hours for $4.95 and additional hours at $2.50/hour, is available. Five e-mail addresses are included.	AT&T WorldNet does not offer an unlimited-usage plan. With the standard plan ($19.95 a month), users get 150 hours, or they can choose an hourly plan at $9.95/month for 10 hours plus $0.99/hour after that. Both plans include one e-mail address. POP3 is supported.	Concentric offers a 30-day free trial with unlimited access. This plan is normally $19.95/month. A starter plan at $7.95/month allows 5 hours monthly. One mailbox is provided free; an extra one costs $10/month.	$19.95/month provides the new user with unlimited access, a free Internet newsletter, a new users' guide, newsgroups, chats, and one e-mail address. Each additional mailbox is $4.95/month.	A trial offer lets new users try the service for 30 days or 30 hours, free. Monthly rates include 100 hours for $19.95; additional hours are $1.95/hour. The base plan is $4.95, with $1.95/hour after 3 hours. IBM allows up to six e-mail addresses, although only one may be online at a time.
Connection speeds/ access numbers	More than 500 POPs across the country. Many support the x2 56-Kbps modem, and a limited number support K56flex. V.90 support is expected by the time you read this.	421 POPs and some 56-Kbps dial-up access. Supports x2 and K56flex modems; V.90 will be implemented soon.	Concentric claims access to over 3,000 U.S. cities with around 350 POPs. 60% of the U.S. has 56-Kbps K56flex support. V.90 support will be offered later in 1998.	More than 1,200 local dial-up numbers are offered, with 56-Kbps service scattered across the country. V.90 support is already available nationally.	Offers more than 500 POPs in the U.S.; most support 56 Kbps. Work to upgrade to V.90 is well under way.
Portal deals/ ISP home page	AOL.com offers more content than most ISP pages, from entertainment to shopping to health. The channel-style presentation makes navigating a breeze.	You can sign up to get WorldNet preconfigured with Excite, Infoseek, or Lycos as your default home page. The AT&T page has an easy-to-navigate, portallike interface.	The Concentric home page doesn't have the rich content of others. It lets you personalize your own front page with links to Excite, Planet Direct, and Snap!	EarthLink's home page is straightforward and full of informative and fun links. Its partnership with the portal Snap! gives it extra flavor.	No portal affiliation, but the IBM Internet Connection's stripped-down home page has links to a variety of search engines.
Technical support (eastern time)	AOL's toll-free 800-827-3338 line is staffed 24 hours, 7 days. AOL has live support online every day from 9:00 A.M. to 1:45 A.M.	Tech support is available 24 hours, 7 days as a fully automated phone service at 800-400-1447. Live online support is available 8:00 A.M. to midnight.	Call 800-745-2747 to speak with a support tech toll-free, 24 hours, 7 days or chat with tech support personnel online.	Live tech support is available 24 hours, 7 days at 800-395-8410.	Live support is available at 800-821-4612 24 hours, 7 days.

modem connection more often than not, you should look elsewhere for service.

Find out how your ISP connects to the Internet backbone. If you're sharing a fractional T1 with hundreds of other users, you could be waiting and waiting for Web pages to download.

MODEM SPEEDS Your 56-Kbps modem won't work to its potential if it isn't supported. Check the company's plans for future expansion, so you'll have the option to switch to an ISDN line, for example. If the ISP has no plans or is just keeping up, it may not be competitive enough to stay around too long.

TECHNICAL SUPPORT Don't underestimate the importance of good, readily available technical support, because you'll likely find yourself stranded at the most inopportune time possible. Ideally, look for an ISP with 24-hour, 7-day-a-week support and preferably an 800 or local number. When the only way to contact the company is via e-mail, what happens when you can't log on?

Before you sign on the dotted line, call the number at a time representative of the hours you'll be keeping and see how often you get a busy signal or get placed in one of those interminable queues (and for how long).

If you already have Internet access, check out the ISP's Web site and see how informative it is and how easy it is to navigate. Look for a frequently asked questions (FAQ) area, which can save you time in the long run by answering those obvious (to someone else) questions.

SERVICES **Web Hosting:** Many ISPs will include 2MB to 5MB of space for a Web page, which is more than adequate unless you want to add a slew of graphics. Check to see if there is an additional charge for the space and ask if more will be available and for how much, should you want to add on later.

be wary of prepayment discounts, unless the contract has an escape clause.

Also, if you plan on being a download supplier to the public for files and graphics, find out whether the ISP charges for download volume. Many ISPs base their hosting on load usage. If your pages put a higher load on their servers, the ISP may reclassify you as a commercial customer (at a higher monthly rate).

E-Mail: Find out which mail client is bundled with the software. Most ISPs will include at least one POP3 e-mail account; if you need more, ask beforehand what the charges will be and whether you have an option to add on later. You should also ask about spam filters, to help eliminate junk mail. Remember that competition for clients among ISPs is strong. And shop around for the service that best meets your needs.—*Kathryn Munro*

MCI Internet	MindSpring Enterprises	MSN Premier	Netcom	Prodigy Internet	SpryNet
New users can download the software they need to connect directly from the site (*www.mci2000.com*), or call 800-550-0927. Comes with IE.	You cannot download the software. For online registration, go to *www.mindspring.com*; for information, call 800-719-4660. Comes with IE.	Download MSN Premier software from the site (*www.msn.com*) or call 800-386-5550. Comes with IE.	Download the software from the site (*www.netcom.com*) or call 800-638-2661. You can choose IE or Netscape.	You can download the software from the site (*www.prodigy.com*) or call 800-213-0992. Comes with IE.	Download the free starter kit directly from the site (*www.sprynet.com*) or call 800-777-9638. Comes with IE.
An initial price of $14.95/month for 150 hours for the first 3 months will go up to $19.95/month for the same number of hours unless you also use MCI Long Distance. Additional usage is billed at $0.99/hour. You also get unrestricted use of newsgroups and one e-mail address.	Offers a variety of dial-up accounts, including Light at $6.95/month for 5 hours and $2/hour for additional hours or unlimited access at $19.95/month. All accounts charge a $25 setup fee, unless you choose prepayment. You get one e-mail address; more available for $5/month.	MSN Premier offers a free trial of one month of Internet access. The MSN Premier Unlimited Plan is $19.95/month. The Premier Plan allows 5 hours/month for $6.95, with additional hours at $2.50. Only one e-mail address per account is allowed.	Netcomplete offers basic service for $19.95/month with unlimited hours and includes one e-mail address. Each additional mailbox has a one-time $5 setup fee and costs $5/month. A $25 setup fee is charged on all accounts but will be waived for online sign-ups.	A special introductory offer of $9.95/month for 3 months of unlimited usage comes with a 30-day money-back guarantee. After 3 months it's $19.95 for unlimited usage. One e-mail account, parental filtering software, and access to thousands of newsgroups are included.	Two pricing plans include unlimited Internet access for $19.95, or 7 hours at $9.95/month, with additional hours at $1.95 each. SpryNet includes one e-mail account and more than 15,000 newsgroups.
MCI Internet has 300 local POPs. Maximum dial-up connections of 56 Kbps are available, and they support x2. Upgrade work is underway for V.90.	350 POPs, although a few areas aren't taking new customers. Speeds of at least 33.6 Kbps, with some x2 for 56-Kbps support. V.90 support will be implemented late summer.	Microsoft would not disclose its number of POPs. There are POPs across the country, with nationwide V.90 56-Kbps support.	300 POPs. Netcomplete offers access up to 33.6 Kbps, while Advantage service ($24.95/month) offers 56 Kbps. Many POPs are already upgraded to support V.90.	Prodigy Internet has 611 POPs, 521 of which offer 56-Kbps x2 support. No V.90 support at this time.	SpryNet has 518 POPs at speeds of at least 33.6 Kbps. Some 56-Kbps x2 support. Plans for V.90 support by end of year.
The MCI home page by itself is very low-key, but you can get Yahoo! preconfigured as your home page.	MindSpring's home page, well organized and attractive, is affiliated with Snap! A click brings you to the portal page for easy surfing.	MSN delivers a wealth of content from its own sites. For more information, see the MSN Internet Start review and the sidebar "Start It Up."	Netcom's home page is simple and straightforward. Not affiliated with any portal, it nevertheless contains links to numerous interesting sites.	Teaming up with Excite, Prodigy Internet's home page is clean and streamlined. It offers 13 channels including Travel, News, and Games, with links to multiple sites.	SpryNet's home page is sparse and somewhat lacking in content, but it does provide some interesting shareware links and some tutorials for newbies.
Call 800-605-2736 for 24-hour, 7-day support.	Call 800-719-4660 for live 24-hour, 7-day support.	Support services available at 425-635-7019, 9:00 A.M. to 1:00 A.M. M–F; 11:00 to 8:00 weekends. Call 888-676-8477 for the automated Fast Tips line.	The toll-free automated express-support service line is 800-638-6383. Live support is available 24 hours, 7 days at 408-861-1810.	Live tech support is available from 7:00 A.M. to 3:00 A.M. by calling 800-213-0992. Online chat support is available from 4:00 P.M. to midnight.	Call 800-557-9614 for 24-hour, 7-day live technical support. Online support includes online chats with tech-support reps.

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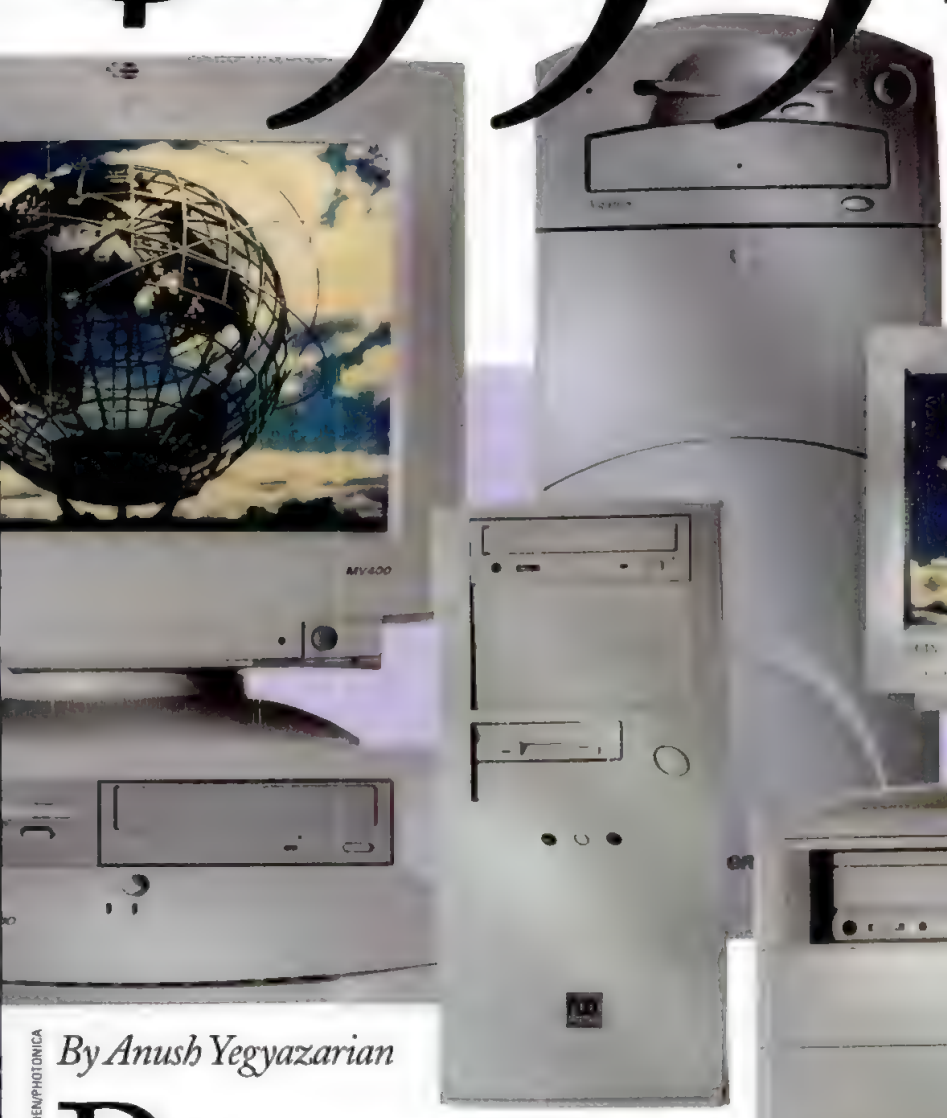
$999 PCs

PC Magazine Labs tests 37 sub-$1,000 PCs to see how much you get and what you give up.



By Anush Yegyazarian

Paying $1,000 isn't a matter of pocket change, but when a new PC costs $1,000, you don't have to think about postponing the purchase of your next car. Your next PC can even be an impulse purchase if you have a credit card handy.

For many years in the 1980s, decent 286 and 386 PCs ran $4,000 to $5,000. In the early 1990s, a 486 PC was $3,000. Two years ago, PCs sold retail averaged $1,800, according to ZD Market Intelligence. As of May, that figure had declined to $1,200. Here we review 37 PCs (both from direct vendors and vendors that sell through retail) priced at $999 or less, exclusive of the monitor.

The sub-$1,000 PC has been with us for a year and a half. After initial skepticism, sales took off during the holiday season

PHOTOGRAPHY BY THOM O'CONNOR, SCREEN IMAGE BY MELISSA HAYDEN/PHOTONICA

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in the fall of 1997. Now, says ZD Market Intelligence (formerly Computer Intelligence), four out of every ten PCs sold for the home cost less than $1,000. Acer, Compaq, and Packard Bell fueled the initial surge of sub-$1,000 PCs. Now every vendor participates, including IBM. (IBM spent much of 1997 trying to capture the $2,500-plus market, which fewer and fewer buyers care about.)

The good news is that even with falling prices, we're getting ever more features for our money. At sub-$1,000 prices (the figure includes the system unit only), you have to make some compromises, but you can get very capable systems that are well suited for most mainstream tasks.

REVIEW CRITERIA

We asked vendors to send us PCs with system units that cost no more than $999 (street), plus companion monitors that typically added $150 to $300 to the prices. Vendors were free to choose the brand and speed of the CPU. We required 32MB of RAM, a minimum of 2MB of video RAM, and a 2GB hard disk. We didn't require sound cards, modems, and network cards. That filter netted us 37 systems, most hovering just under $1,000, and one as low as $759.

www.pcmag.com

Please join us online for an interactive look at this roundup of 37 sub-$1,000 machines.

Notable absences from the roundup include Packard Bell (which was between product lines at the time of our tests) and the three major direct vendors: Dell Computer Corp., Gateway, and Micron Electronics chose not to participate, saying they do not market systems at this price. Actually, they almost do: Most sell Pentium II/266 systems with 15-inch monitors for about $1,450.

WHAT $1,000 BUYS NOW

Although the range of systems and performance varied considerably among the units we tested, here's what you can expect in a system unit for $1,000 now:

- an Intel Pentium II processor, commonly running at 266 MHz, though retail systems come with less powerful AMD K6/266, Intel Pentium MMX/266, and Intel Celeron/266 processors;
- a 3GB or 4GB hard disk (our Editors' Choice product, from Axis Systems, came with 6.4GB);
- 4MB of graphics RAM (nine systems came with 8MB);
- a 56-Kbps data/fax modem; and
- a 32X CD-ROM drive.

You'll find that vendors cut corners wherever possible, acquiring the most cost-effective drives, keyboards, mice, cases, and so on. Ditto for the monitors.

PERFORMANCE

Predictably, systems with faster processors performed best. In this roundup, the fastest processor was the Pentium II/300, used in four systems. The Aberdeen unit did come with a 333-MHz CPU, but it was overclocked, invalidating its scores. Overclocking a processor—running it at a faster speed than it's supposed to have—can lead to reliability and performance problems and invalidates the manufacturer's part warranty.

The 300-MHz AMD and Cyrix processors kept up with the 266-MHz Pentium II competition on our Winstone test suites, which measure performance on business applications, but not on our 3D WinMark tests. The floating-point units of AMD and Cyrix processors aren't as good as those of Pentium II CPUs, hindering their 3-D performance. For games, an Intel processor is your best bet.

We also saw Intel's new Celeron CPU in this roundup. Celeron is based on the Pentium II core, but its current lack of an L2 cache hindered performance on our Winstone tests. The Pentium II core, however, helped Celeron systems on our 3-D tests. Based on what we saw, we don't recommend purchasing today's Celeron systems. The new versions of Celeron with L2 cache (code-named Mendocino), due early this fall, may be worthwhile.

RETAIL: A STEP BEHIND

In this roundup, the most powerful configurations came from the smaller direct vendors. If you're uncomfortable buying from a lesser-known vendor or from direct vendors, you will have to scale down your specifications. The retail vendors here used Pentium MMX or K6 CPUs for the most part, and a few used Intel's new Celeron. Retail vendors' PCs also have less L2 cache in general (most here had 256K rather 512K, and Celeron systems of

Editors' Choice

- Axis Orion LXN266

In the sub-$1,000 category, top value is key, and our Editors' Choice winner—the Axis Orion LXN266 ($995 direct)—offers that with the best combination of price, performance, and features in this roundup.

The Orion LXN266 has familiar components, beginning with a Pentium II/266 and a 6.4GB IBM Ultra ATA hard disk. For top 3-D graphics, it has Cardexpert's i740 AGP card, which has 8MB of SDRAM and Intel's i740 chip set. The unit performed well across all our tests, notably the 3D WinMark. You also get a 56-Kbps modem and a 32X Toshiba CD-ROM drive. Wavetable sound, powered by a Creative Labs card, is played through a set of Altec Lansing ACS 45 speakers with a small subwoofer. The warranty covers two years on parts and three on labor.

If your budget is tight and every dollar counts, you may want to check out the Micro Express MicroFlex-4500 ($899 direct), which earns an honorable mention. Based on AMD's K6/300, it comes with a 4.3GB Ultra ATA Quantum hard disk, an ATI-based graphics card with 4MB of SGRAM, hardware MPEG-2 decoding for better video, Creative Labs audio, and the same CD-ROM drive as the Axis unit. On our Winstone tests, its performance was on a par with that of Pentium II/266–based units. The unit has a four-year warranty.

If you prefer to purchase through the retail channel, check out the Acer Aspire 1832 ($900 street) and IBM Aptiva E46 ($999 street), both of which also earn honorable mentions. Both are AMD K6/266–based units and come with ATI-based graphics, hardware MPEG-2 decoding, a 56-Kbps modem, a 24X CD-ROM drive, and integrated Crystal sound. The Acer unit has a 5.4GB disk, while the IBM has a 4.1GB disk.

Acer bundles some good software and includes 17 hours per month of free Internet service for 3 months. IBM's bundle is also good and includes Lotus SmartSuite. On our latest Service and Reliability Survey, IBM had top scores across the board, while Acer had mostly average results except for a worse-than-average score on units needing repair in the past 12 months.

course had none), although hard disk sizes and graphics are comparable with those from the small direct vendors.

Note that most of the machines' graphics subsystems are adequate for 2-D graphics—which is fine for business applications. For games, look for systems whose 3D WinMark scores were at least 300, or 500 if you want to play some of the more 3-D–intensive games (like Forsaken and Quake II). Eight systems in our roundup had scores of 500 or more.

We saw some units with good Creative Labs Sound Blaster or Ensoniq cards with wavetable synthesis, but many offer the less realistic FM synthesis only.

Note also that three systems—the CTX SAK305, DMI Value 100, and Mega Optima 300—lack USB ports. USB scanners, digital still cameras, and videoconferencing cameras are likely to become widely available in the coming year, now that Windows 98 includes improved USB support.

We saw 14 systems lacking free IRQs, or interrupt requests. These requests are the means through which different devices get the processor's attention. If a PC lacks free IRQs, you can't add more hardware to your system without juggling the existing IRQ load; this process can be time-consuming and can lead to conflicts among existing hardware.

Watch out for restocking fees. A growing number of vendors require you to pay 10 to 15 percent of the purchase price of the PC if you return it (SIA and Tagram charge 25 percent). A few don't allow returns at all. You'll find this is true in retail stores as well.

The moral is that if you plan to purchase a $999 system, you should know where you're willing—and unwilling—to compromise.

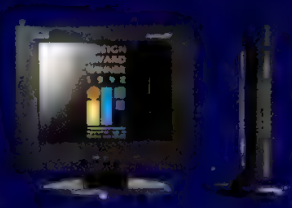
Aberdeen Inverness D20

Pentium II/333, 4.3GB disk, 15" monitor ($174), 32MB SDRAM. Winstone: N/A. $999 direct. Aberdeen LLC, 800-552-6868, 562-801-5626; www.aberdeeninc.com; 531 at www.pcmag.com/infolink.

● One of two 333-MHz Pentium II systems reviewed, the build-to-order Aberdeen Inverness D20 is a relatively powerful value offering—if a flawed one. Aberdeen sells the machine primarily to corporate users, forgoing a modem and sound card but including a network adapter.

The system's CPU alone would likely put it at the top of the performance heap in this roundup. But the system arrived at our labs with its processor overclocked to 343 MHz—a fact that Aberdeen denies. For that reason, we are not reporting the test

Our Contributors: ROBERT S. ANTHONY and CADE METZ are senior writers at *PC Magazine*. MARY E. BEHR is a staff editor, and ANGELA TUKA is an editorial researcher at *PC Magazine*. FRANK J. EVANS is a technical consultant and frequent contributor to *PC Magazine*. RICHARD FISCO was the project leader, and ANUSH YEGYAZARIAN was the associate editor in charge of this story.



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Performance/Features Ranking

denotes Editors' Choice

The sub-$1,000 machines in this roundup are too close in price to be plotted within our traditional price/performance index. Thus we are ranking them on features and performance alone.

The unit that earns the highest ranking is the $995 Axis Orion LXN266, our Editors' Choice. The Axis unit came loaded with some hot hardware, notably a Cardexpert Technology AGP graphics board with an Intel i740 graphics chip set, 8MB of SDRAM, and a 6.4GB hard disk—one of this roundup's largest. This combination helped the unit perform well, especially on our 3D WinMark tests.

The second-place unit, the $900 Micro Express MicroFlex-4500, includes an ATI Xpert@Work AGP 2X graphics card (with an ATI 3D Rage Pro Turbo chip set and 4MB of SGRAM) and a 4.3GB hard disk. The unit stands out for its AMD K6/300 CPU and 100-MHz system bus, as well as its four-year warranty.

The iDOT.com 266LX, from newcomer iDOT.com, the first Internet-based computer seller, is a great machine for entry-level gaming, as evidenced by a top-ten 3D WinMark score. To enhance the gaming experience, excellent sound is provided by PCI audio and two midsize external speakers.—*Analysis written by Mary E. Behr*

THE RANKINGS

We put these products in rank order based on performance/features scores. Service policies account for 26 percent of each score; benchmark test performance on our Winstone and 3D WinMark tests makes up 30 percent. Expandability—free PCI slots and hard disk bays—counts for 12 percent. Graphics cards, sound cards, and hard disk size make up the rest of the score.

Rank	System	CPU	Price
1	Axis Orion LXN266	Pentium II/266	$995 direct
2	Micro Express MicroFlex-4500	AMD K6/300	$899 direct
3	iDOT.com 266LX	Pentium II/266	$999 direct
4	American Multisystems InfoGold PII	Pentium II/266	$995 direct
5	Sys Performance Pro 300P	Pentium II/300	$995 direct
6	nextPC NK6-266	AMD K6/266	$839 direct
6	Polywell Poly 800B8	Pentium II/300	$988 direct
8	Tagram Thunderbolt V2300	Pentium II/300	$814 direct
9	Aberdeen Inverness D20	Pentium II/333	$999 direct
10	NextTrend NexStar-266L	Pentium II/266	$989 direct
10	SAG STA BX266	Pentium II/266	$999 direct
12	Tiger K-Series 300	AMD K6/300	$800 direct
13	CompUSA PC American Pro AP266C	Celeron/266	$849.95 direct
13	CTX/PC Channel SAK305	AMD K6/300	$900 street
15	CyberMax ValueMax H2	Cyrix MII/300	$900 direct
15	DTK APRI-76M/P233	Pentium II/233	$970 street
17	Acer Aspire 1832	AMD K6/266	$900 street
18	MidWest Micro PRH-266	Pentium II/266	$820 direct
18	Unitek UT-PII266 Courier	Pentium II/266	$899 direct
18	Zenon 3D Power Pro	Celeron/266	$850 direct
21	Total Peripherals Serengeti	Pentium II/266	$936 direct
22	Comtrade BestBuy Pro BP266	Pentium II/266	$999 direct
23	SIA P6/266 Advanced Pentium II	Pentium II/266	$987 direct
24	AMAX Access 6266	Pentium II/266	$920 direct
24	Unicent Avanta E266	Celeron/266	$849 direct
26	ProGen Discover3D PII300	Pentium II/300	$859 direct
27	ACT EcoPower	Pentium II/266	$849 direct
27	IBM Aptiva E46	AMD K6/266	$999 street
29	Mega Computer Optima 300	AMD K6/300	$799 direct
30	Digital PC 3500 6233 LP	Pentium II/233	$950 street
30	NETiS Best Buy	AMD K6/266	$945 direct
32	MegaTrends Pegasus	Celeron/266	$999 direct
33	Monorail 6020	Celeron/266	$999 street
34	Premio Apollo Professional System	Pentium MMX/200	$824 direct
35	Compaq Presario 2254	AMD K6/266	$900 street
35	HP Pavilion 3265	Pentium MMX/233	$800 street
37	DMI Computers Value 100	Pentium MMX/233	$759 direct

results for this unit. Overclocking a processor may subject it to overheating and overstress after long periods of operation, and doing so invalidates the part's warranty from Intel. The machine's AGP graphics card, the ATI Xpert 98, should deliver respectable 3-D performance.—*Cade Metz*

Acer Aspire 1832

AMD K6/266, 5.4GB disk, 15" monitor ($199), 32MB SDRAM. Winstone: 18.7. $900 street. Acer America Corp., 800-733-2237, 408-432-6200; www.acer.com; 532 at www.pcmag.com/infolink.

● Available at retail outlets, the Acer Aspire 1832 offers a generous amount of software and is a strong performer in its class. It is a true home PC and comes with good documentation and color-coded cables, some free Internet access, Microsoft Works, Quicken 98 Basic, and Acer diagnostic and user-assistance software.

The sculpted midtower offers adequate expansion room, and the unit posted the top Winstone 98 score in its CPU class. Thanks to the unit's ATI Rage Pro graphics chip set, its 3D WinMark 98 score was average for its CPU class, but AMD-based systems in general can't keep up with Pentium II PCs on 3D WinMark. Acer's scores on our Service and Reliability Survey were mostly average, with one below-average result.—*Robert S. Anthony*

ACT EcoPower

Pentium II/266, 4.1GB disk, 15" monitor ($140), 32MB SDRAM. Winstone: 21.2. $849 direct. All Computer Technology, 800-775-1953, 626-369-4181; www.allcomp.com; 533 at www.pcmag.com/infolink.

● ACT's machine is among the roundup's leading Pentium II/266 models: It had the top Winstone 98 performance for its CPU class. But with its S3-based AGP card, the unit's 3-D performance was well below average—even compared with that of many Celeron and K6 PCs. That means

AMAX Access 6266, American Multisystems InfoGold PII, Compaq Presario 2254, Axis Orion LXN266.

that though the unit should do well in small offices, it isn't as well suited for home use.

This mini-tower includes an ISA sound card and two large speakers (delivering serviceable audio) yet lacks a modem or network card. One complaint: The machine's CPU and memory slots are obstructed by its power supply and drive cables.—*CM*

AMAX Access 6266

Pentium II/266, 3GB disk, 15" monitor ($169), 32MB SDRAM. Winstone: 15.3. $920 street. AMAX Engineering Corp., 800-800-6328, 510-651-8886; www.amax.com; 534 at www.pcmag.com/infolink.

● The AMAX Access 6266 mini-tower was weak on our Winstone 98 tests, but it has some good features for corporate users. The motherboard supports wake-on-modem-ring, which wakes the system when you get a call to your modem, and offers an optional chassis intrusion detector.

The small Intel motherboard has just one ISA slot and two PCI slots, but the system integrates most of what you'll need. You'll find integrated ATI graphics, an ATI Media Channel connector for graphics upgrade modules, a Yamaha 32-voice wavetable audio chip set, and a MIDI port. The 56-Kbps voice modem is bundled with a fax and voice mail manager. The AMAX Access 6266 posted the lowest Business Winstone 98 score in its CPU class, but its 3D WinMark score was average.—*RSA*

American Multisystems InfoGold PII

Pentium II/266, 4.3GB disk, 15" monitor ($285), 32MB SDRAM. Winstone: 20.9. $995 direct. American Multisystems, 800-888-6615, 408-945-2296; www.infogold.com; 535 at www.pcmag.com/infolink.

● This well-equipped mini-tower is an almost flawless sub-$1,000 option. It produced above-average scores for its CPU class across our tests, and in fact, its Winstone score was the third-highest among 266-MHz Pentiums.

Yet the InfoGold does not sacrifice attractive accoutrements. Not only does it have a sound card, two stereo speakers, a 56-Kbps modem, an IntelliPoint mouse, and two video-out ports (as part of its graphics card), but it ships with 20 multimedia CDs—including a world atlas, a U.S. atlas, and the Grolier Interactive Encyclopedia. The warranty covers parts for only a year but offers three years for labor. One caveat: If you have to return the system, you'll pay a 15 percent restocking fee.—*CM*

Axis Orion LXN266

Pentium II/266, 6.4GB disk, 15" monitor ($199), 32MB SDRAM. Winstone: 21.1. $995 direct. Axis Systems, 800-378-9014, 714-238-9207; www.axissys.com; 536 at www.pcmag.com/infolink.

PC MAGAZINE EDITORS' CHOICE

The Axis Orion LXN266 midtower—our Editors' Choice—offers a terrific hardware bundle, which led to some excellent performance on our 3D WinMark and Business Winstone 98 tests. Its 3-D performance comes courtesy of its Cardexpert Technology AGP graphics board with an Intel i740 graphics chip set and 8MB of SDRAM; it also boasts one of this roundup's largest hard disks, at 6.4GB.

You also get the latest in audio and modems: The wavetable sound board, a Creative Labs Ensoniq Audio PCI, and the modem, a Diamond Multimedia SupraMax PCI 56-Kbps V.90 voice model, are PCI devices. Also included are communications software, two small Altec Lansing ACS45 bookshelf speakers, and a subwoofer. One PCI slot, both ISA slots, and two of three DIMM slots are available. The unit is covered for two years of parts and three of labor.—*RSA*

Vendor Service and Reliability

We rate vendors for which we received at least 50 responses in our latest Service and Reliability Survey of 17,000 subscribers. For the details, see page 219 of our issue of July 1998. The **satisfaction** rankings reflect respondents' experience with **reliability, repair,** and **technical support** over the past two years. **Units needing repair** refers to the proportion of the systems that the respondents said needed repair during the past year. **Buy again?** indicates the proportion of respondents who would buy a new PC from the same vendor.

▲ Significantly better than average
○ Average
▼ Significantly worse than average

	Units needing repair over the past 12 months	Satisfaction with:			
		Reliability	Repair	Tech support	Buy again?
Acer	▼	○	○	○	○
Compaq	▲	▲	○	▲	▲
Digital	○	▲	○	▲	○
DTK	○	○	○	○	○
Hewlett-Packard	▲	▲	▲	▲	▲
IBM	▲	▲	▲	▲	▲
MidWest Micro	○	○	▲	▲	○

We're very pleased to accept another virtual award.

Recently our web site was named Most Innovative and Dynamic Site by *Inside Flyer International*. We were also chosen Best Airline Website by *Internet World Magazine* and Select Site by *Dow Jones Business Directory*. They're just a few of the many Internet awards we've won in the last year. See for yourself. Visit nwa.com. You'll be amazed at everything you can do.

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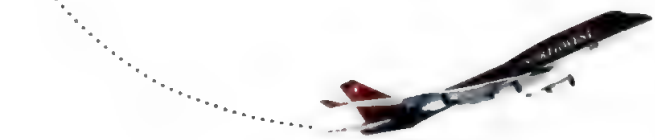

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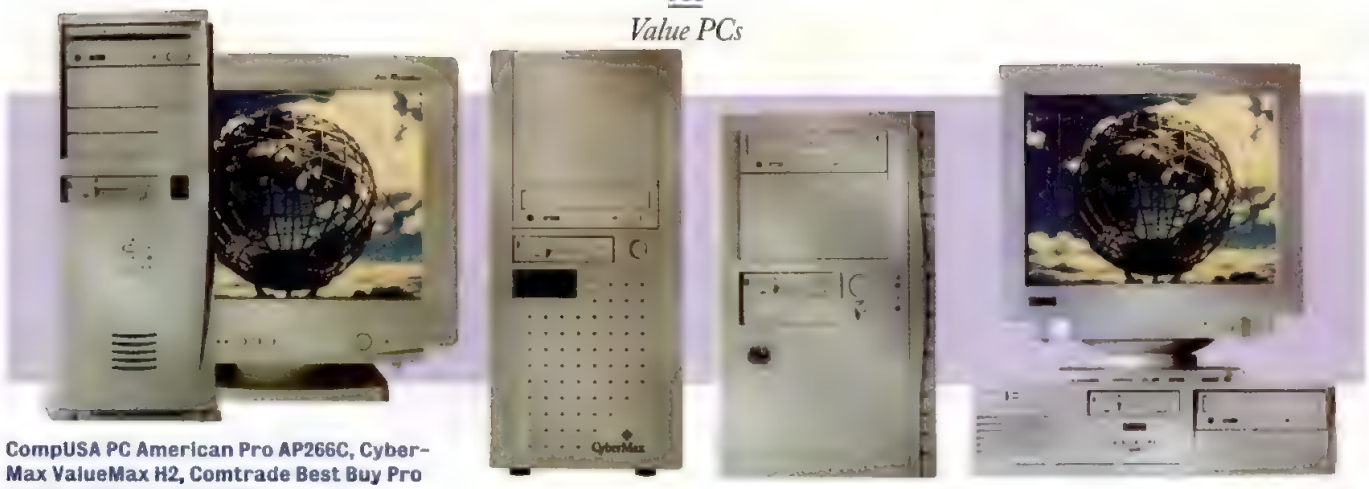

CompUSA PC American Pro AP266C, CyberMax ValueMax H2, Comtrade Best Buy Pro BP266, Digital PC 3500 6233LP.

Compaq Presario 2254

AMD K6/266, 4.0GB disk, 15" monitor ($200), 32MB SDRAM. Winstone: 15.9. $900 street. Compaq Computer Corp., 800-345-1518, 281-370-0670; www.compaq.com.

● Though it boasts enough multimedia amenities to satisfy most consumers, the Compaq Presario 2254 (sold through retail) was one of our roundup's poorest performers. The unit offers 360-degree positional sound, a 56-Kbps modem, and a multimedia keyboard with CD controls and programmable Internet hotkeys, and the monitor integrates stereo speakers. Compaq also offers 50 free hours of Internet access (provided through GTE), and users receive a $100 rebate if they take advantage of it.

This desktop has little expansion room—maximum memory is just 64MB—and relies on sub-par core hardware. Compaq, however, received good scores on our Service and Reliability Survey.—*CM*

CompUSA PC American Pro AP266C

Celeron/266, 3.2GB disk, 15" monitor ($199), 32MB SDRAM. Winstone: 15.2. $849.95 direct. CompUSA, 800-266-7872, 972-982-4000; www.compusa.com; 538 at www.pcmag.com/infolink.

● Available through CompUSA's stores or direct, the CompUSA PC American Pro AP266C offers quality 3-D graphics performance for a value PC. The unit uses a drawerless 33X Pioneer CD-ROM drive, and it comes with CompUSA's own suite of diagnostic software. It also comes with an Aztech 56-Kbps voice modem and a set of Altec Lansing ACS43 bookshelf speakers.

The unit was an above-average performer on our 3D WinMark 98 tests. Its Winstone 98 score was average among the scores of all reviewed Celeron systems, but Celeron-based units were the weakest performers in these tests.—*RSA*

Comtrade Best Buy Pro BP266

Pentium II/266, 4.3GB disk, 14" monitor ($140), 32MB SDRAM. Winstone: 19.4. $999 direct. Comtrade Inc., 800-969-2123, 626-961-6688; www.comtrade.com; 539 at www.pcmag.com/infolink.

● The Comtrade Best Buy Pro BP266 is, in most every sense, the typical sub-$1,000 machine. The unit produced mostly average test scores for its class, but its 3D WinMark score was below average, so it won't satisfy your gaming needs.

The Best Buy mini-tower ships with a fair audio card and two stereo speakers, but the system lacks a modem. Comtrade customizes the operating system using quaint icons and rather obtrusive sound effects. Though such can quickly become bothersome, Windows 95 is easily reconfigured. The Best Buy also has a poorly designed interior: Its CPU and memory subsystem, hidden behind the system's power supply and cabling, are difficult to upgrade.—*CM*

CTX SAK305

AMD K6/300, 4.3GB disk, 15" monitor ($299), 32MB SDRAM. Winstone: 19.7. $900 street. CTX Computer, 800-742-5289; www.ctxcomputer.com; 540 at www.pcmag.com/infolink.

● With solid 3-D graphics performance and ample expansion room, the CTX SAK305 holds its own as a value PC for home or corporate use. Available through retailers, the system counts among its home-friendly features an AGP graphics card with an nVidia RIVA 128 chip set and 4MB of SGRAM—which led the unit to strong 3-D performance—and a 56-Kbps voice modem, with wake-on-modem-ring. All four PCI slots and two of five drive bays in the midtower are open for expansion. The unit's Winstone score was average for its class.

The Giga-Byte Technology motherboard has a USB connector, but no USB ports are attached. The motherboard supports corporate PC features such as keyboard power-on and software power-down. Other perks include a Microsoft ergonomic keyboard.—*RSA*

CyberMax ValueMax H2

Cyrix MII/300, 4.1GB disk, 15" monitor ($199), 32MB SDRAM. Winstone: 18.8. $900 direct. CyberMax Computer Inc., 800-345-8426, 610-770-1808; www.cybmaxpc.com; 541 at www.pcmag.com/infolink.

● The CyberMax ValueMax H2 is a fair value and our roundup's lone Cyrix-based system. It achieved Winstone 98 and CPUmark$_{32}$ scores that rival those of many of the 233- and 266-MHz Pentium IIs reviewed here. This mini-tower uses Cyrix's MII/300 processor and a Socket 7 chip set from ALi.

Although it managed mostly average test scores relative to those in the entire roundup, the ValueMax—using a Diamond Stealth 3Dpro card (with 4MB of EDO DRAM)—was a poor performer on our 3D WinMark tests, so it's unsuitable for you if you plan to play 3-D games. It includes a wavetable PCI audio card, good Altec Lansing stereo speakers, a 56-Kbps modem, and is covered for three years of parts and one year of labor.—*CM*

Digital PC 3500 6233LP

Pentium II/233, 3.2GB disk, 15" monitor ($265), 32MB SDRAM. Winstone 98: 20. $950 street. Digital Equipment Corp., 800-344-4825, 508-234-2298; www.windows.digital.com; 542 at www.pcmag.com/infolink.

● The Digital PC 3500 6233LP slim desktop includes good documentation and had solid Winstone performance. Lack of audio hardware and weak 3-D support make it suitable for office use but not for the home. Digital is now part of Compaq Computer Corp., and Digital PCs will gradually be integrated into Compaq's existing lines.

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- PC Magazine

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Micron MicroTower featured in photo.

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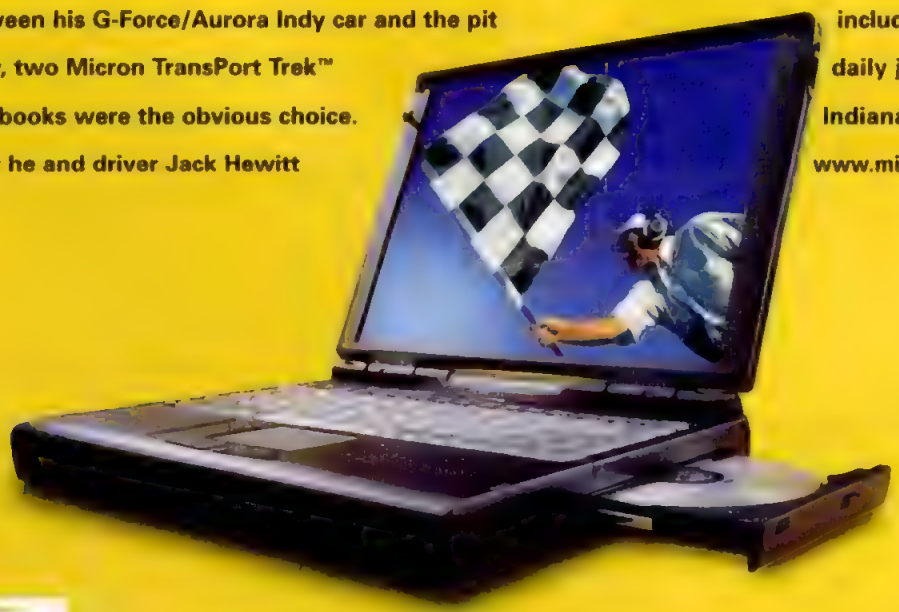

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"The TransPort Trek is the Fastest Budget Notebook We've Run Through Our Mill."

- PC World, *Ranked #1, April '98*

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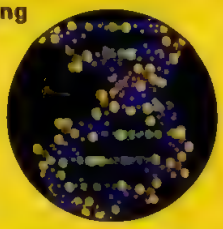

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Although systems under $1,000 are in a clear-cut category, the CPUs that you'll find in those systems run the entire gamut. From Intel's new Celeron chip to its flag-bearer Pentium II CPU and chips from AMD and Cyrix, the mix is extremely varied. And though the speed ratings are similar, they just don't convert to performance. Savvy buyers will look beyond megahertz and familiarize themselves with processor types and the specifications of the various components in the systems they are considering.

For power in processors, look for Intel's Pentium II CPUs and the 300-MHz chips from AMD and Cyrix. In this price class, hard disks are not the leading-edge, 7,200-rpm models we typically find in the review units, and some may not support Ultra ATA. Also, the graphics cards may not be adept at running 3-D graphics. The most adept 3-D graphics cards were based on the Intel i740 and nVidia RIVA 128 chip sets. The faster disks in this roundup were the Seagate Medalist ST34520A and IBM DHEA-34331; both hold roughly 4GB, support Ultra ATA, and spin at 5,400 rpm.

Our gauge for top system performance is the ZD Business Winstone 98 benchmark program. The top processor, the Pentium II/300, powered the best-performing system (we don't consider the Pentium II/333 in the Aberdeen Inverness D20 because of an overclocked processor; see the explanation below). The Pentium IIs did face a challenge from the AMD K6: The K6/300 units' performances averaged just slightly better than those of the Pentium II/266 units.

If not for the Pentium MMX processors, the Celeron machines would have come in last on the Winstone tests. Celerons are based on the Pentium II processor core, but current versions lack L2 cache. Without L2 cache, they simply can't compete with other processors running the typical business applications used in Winstone 98.

The Celeron's ZD CPUmark$_{32}$ score puts it about on a par with a 200- or 233-MHz Pentium MMX CPU with 512K of L2 cache. In this, our first look at Celerons in a major roundup, only one system paired the CPU with the chip set and motherboard that Intel created for it. The 440EX chip set is a lower-cost variant of the Pentium II's 440BX, which supports a 66-MHz system bus (not the 100-MHz bus of the BX) and, generally, has fewer expansion slots. Of the five Celeron-based systems in this roundup, only one, the Monorail 6020, used the EX chip set. The new microATX motherboard is a smaller board with two DIMM slots and only one ISA and two PCI slots, plus AGP on the motherboard. No systems in this roundup used this motherboard.

The Aberdeen Inverness D20 came to us with a pushed processor. Its Pentium II/333 CPU was running at 343 MHz and was therefore the top scorer. Overclocking a processor to get higher performance is risky, though. It can cause added stress on the CPU, which leads to performance and reliability problems and will void the warranty from Intel. Because of the overclocking, all the Aberdeen unit's scores are listed as *N/A* (not applicable).

The 266-MHz and 300-MHz AMD K6 units performed admirably but were not quite up to Pentium II performance on our integer-math-based CPUmark$_{32}$ test. The K6 units' scores averaged about 27 percent lower than the Pentium II/266 units and about 28 percent lower than the Pentium II/300 units. We also had one 300-MHz Cyrix MII system, the CyberMax ValueMax H2, which performed on a par with the AMD K6/300 systems; each had 512K of L2 cache.

Processor speed doesn't account for everything, as evinced by the Celeron systems' performance on our ZD Winstone 98 tests, especially when compared with Pentium II systems of the same clock speed. Celerons did beat Pentium MMX processors

ZD Business Winstone 98
Bold denotes first place.
denotes Editors' Choice.

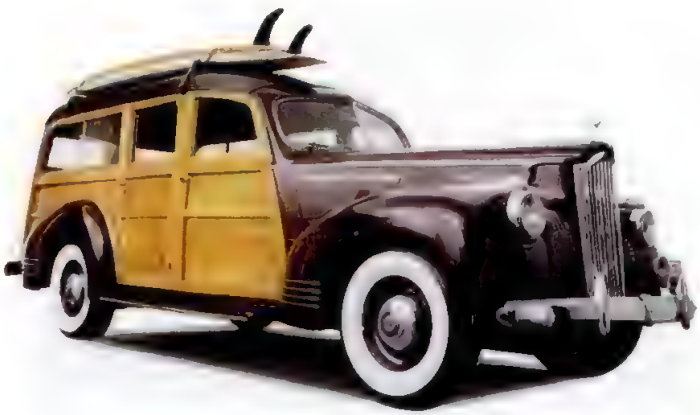
	CPU	ZD Business Winstone 98
Aberdeen Inverness D20	PII/333	N.A
Acer Aspire 1832	K6/266	18.7
ACT EcoPower	PII/266	21.2
AMAX Access 6266	PII/266	15.3
American Multisystems InfoGold PII	PII/266	20.9
Axis Orion LXN266	PII/266	21.1
Compaq Presario 2254	K6/266	15.9
CompUSA PC American Pro AP266C	C/266	15.2
Comtrade Best Buy Pro BP266	PII/266	19.4
CTX/PC Channel SAK305	K6/300	19.7
CyberMax ValueMax H2	MII/300	18.8
Digital PC 3500 6233LP	PII/233	20.0
DMI Computers Value 100	PMMX/233	15.6
DTK APRI-76M/P233	PII/233	18.1
HP Pavilion 3285	PMMX/233	12.0
IBM Aptiva E46	K6/266	17.1
iDOT.com 266LX	PII/266	20.6
Mega Computer Optima 300	K6/300	19.2
MegaTrends Pegasus	C/266	16.8
Micro Express MicroFlex-4500	K6/300	20.4
MidWest Micro PRH-266	PII/266	18.3
Monorail 6020	C/266	14.5
NETiS BestBuy	K6/266	17.4
nextPC NK6-266	K6/266	18.2
NexTrend NexStar-266L	PII/266	20.6
Polywell Poly 800B8	PII/300	22.7
Premio Apollo Professional System	PMMX/200	13.9
ProGen Discover3D PII300	PII/300	21.3
SAG STA BX266	PII/266	19.7
SIA P6/266 Advanced Pentium II	PII/266	20.0
Sys Performance Pro 300P	PII/300	24.1
Tagram ThunderBolt V2300	PII/300	22.8
Tiger K-Series 300	K6/300	20.1
Total Peripherals Serengeti	PII/266	18.6
Unicent Avanta E266	C/266	16.0
Unitek UT-PII266 Courier	PII/266	20.6
Zenon 3D Power Pro	C/266	15.5

BETTER ▶

N/A—Not applicable. The product was improperly configured for testing.

▲ ZD Business Winstone 98 The champ was the Sys Performance Pro 300P, based on a Pentium II/300. Hard disks, graphics cards, and processors all play a part in creating top performers. The IBM DHEA-34331 and the Seagate Medalist ST34520A, both 5,400-rpm hard disks, were the fastest in this roundup. For top 2-D graphics performance, look at the systems using the two entries from Matrox—the Millennium II and the new G200—as well as the S3 ViRGE GX2.

My business lives way beyond my desk.



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BENCHMARK TESTS

on the Winstone tests, but got comparable results on our CPUmark$_{32}$ tests. When it comes to 3D WinMark 98, however, Celerons perform much better than Pentium MMXs. The Celeron's enhanced floating-point unit is the same as that of the Pentium II CPU, so it was able to help accelerate the chip during parts of the 3-D tests. These tests rely on a CPU's floating-point unit as well as the 3-D capabilities of the graphics processor. Hard disks were similar in systems with either processor, but there were differences in graphics cards. All the graphics cards in the Celeron systems were AGP-based, while the Pentium MMX systems' cards were PCI-based. Also, the graphics chips in the Pentium MMX units tended to be older models that don't accelerate as many 3-D functions, but the Celeron systems used newer chips, including Matrox's new G100 and Intel's i740 graphics processors. The top two 3-D performers were the NexTrend NexStar-266L and the Axis Orion LXN266. Both systems use Pentium IIs and have graphics cards based on the Intel i740 chip set. These systems even bested the small group of Pentium II/300 systems in the roundup, which did not use the top-performing i740 chip set.

For a tested function in ZD 3D WinBench 98, the HAL (Hardware Abstraction Layer) reports whether the graphics chip supports that capability. In this roundup, three systems—the HP Pavilion 3265, the NETiS BestBuy, and the Premio Apollo Professional System—did not have a HAL loaded. The graphics chip or board manufacturer should provide the HAL. The HAL can be part of the display driver or a separate DLL that communicates with the display driver. Microsoft's DirectDraw segment of DirectX provides device independence through the HAL. DirectDraw uses the HAL to work directly with the graphics card. In the three systems that did not have HALs, all the 3-D tests were run in 3-D emulation mode, and the scores were therefore extremely low.

How We Tested

Each of the tested sub-$1,000 PCs had 32MB of RAM, ran Windows 95, and had a 2GB or larger hard disk. Before testing, we prepared each unit following a standard procedure to create a common testing state for all systems: We stripped the unit's start-up configuration of all processes and tasks except Systray and Explorer. We set the display to 800-by-600, with 65,536 colors and small fonts to run the Winstone and CPUmark$_{32}$ tests. We also disabled all power-management features. We defragmented the hard disk before each test and let Windows 95 manage virtual-memory settings. Unless otherwise noted, we used the graphics driver the vendor provided. We ran 3D WinBench in the default 640-by-480 resolution, with 65,536 colors.

We used our benchmark test program **ZD Winstone 98** to measure performance on 32-bit Windows applications. Winstone 98 is divided into two parts: ZD Business Winstone 98, focusing on mainstream applications, and ZD High-End Winstone 98, which emphasizes CPU and graphics-intensive applications. We ran only our Business Winstone 98 tests, which measure the time a PC takes to execute a set of scripts that exercise nine of the best-selling Windows 95 applications. Business Winstone weights a PC's test timings based on the applications' unit market shares; it derives a composite number and converts that to a relative score. (The score is relative to the performance of a Dell Dimension Pentium/133 with 32MB of RAM, at 1,024-by-768 resolution with 16-bit color, running Windows NT 4.0 with Service Pack 3. The base score is defined as 10.)

ZD WinBench 98 measures a system's graphics, disk, processor, CD-ROM, full-motion video, and DirectDraw performance under Windows 95. For this roundup we chose to run only the processor test. The **ZD CPUmark$_{32}$** test gauges the speed of a PC's processor subsystem, which includes the CPU, primary and secondary cache, and system RAM, under 32-bit operating systems. CPUmark$_{32}$ emulates the CPU activity of real-world 32-bit applications.

We used **ZD 3D WinBench 98** to evaluate 3-D graphics performance and to assess a system's ability to execute certain 3-D rendering features. First we performed the 3D Quality test to determine which of the 31 tested features the graphics card supports, then we ran the performance portion of 3D WinBench 98 to obtain the **ZD 3D WinMark 98** score. The test is made up of 19 scenes; each scene is rendered by hardware if the graphics card is found to support all the 3-D options in the scene based on the 3D Quality test. If not, the scene is rendered in software. On each system, we installed Direct3D 5.0 if it was not previously installed by the vendor, before running the test.—*Analysis written by Rich Fisco*

ZD 3D WinMark and CPUmark$_{32}$

High scores are best.
Bold type denotes first place.
denotes Editors' Choice.

	CPU	ZD 3D WinMark 98	ZD CPUmark$_{32}$
Aberdeen Inverness D20	PII/333	N/A	N.A
Acer Aspire 1832	K6/266	31	528
ACT EcoPower	PII/266	111	691
AMAX Access 6266	PII/266	371	660
American Multisystems InfoGold PII	PII/266	437	673
Axis Orion LXN266	PII/266	582	699
Compaq Presario 2254	K6/266	84	496
CompUSA PC American Pro AP266C	C/266	353	359
Comtrade Best Buy Pro BP266	PII/266	171	688
CTX/PC Channel SAK305	K6/300	360	530
CyberMax ValueMax H2	MII/300	93	597
Digital PC 3500 6233LP	PII/233	42	609
DMI Computers Value 100	PMMX/233	18	418
DTK APRI-76M/P233	PII/233	521	595
HP Pavilion 3265	PMMX/233	15	397
IBM Aptiva E46	K6/266	31	524
IDOT.com 266LX	PII/266	570	660
Mega Computer Optima 300	K6/300	62	606
MegaTrends Pegasus	C/266	171	481
Micro Express MicroFlex-4500	K6/300	263	669
MidWest Micro PRH-266	PII/266	111	650
Monorail 6020	C/266	320	357
NETiS Best Buy	K6/266	13	564
nextPC NK6-266	K6/266	312	568
NexTrend NexStar-266L	PII/266	633	680
Polywell Poly 800B8	PII/300	536	774
Premio Apollo Professional System	PMMX/200	12	382
ProGen Discover3D PII300	PII/300	158	739
SAG STA BX266	PII/266	578	726
SIA P6/266 Advanced Pentium II	PII/266	128	690
Sys Performance Pro 300P	PII/300	96	782
Tagram ThunderBolt V2300	PII/300	513	818
Tiger K-Series 300	K6/300	328	599
Total Peripherals Serengeti	PII/266	389	676
Unicent Avanta E266	C/266	218	399
Unitek UT-PII266 Courier	PII/266	487	691
Zenon 2D Power Pro	C/266	450	378

N/A—Not applicable. The product was improperly configured for testing.

▲ ZD 3D WinMark 98 and CPUmark$_{32}$ The two top 3-D performers were the NexTrend NexStar-266L and the Axis Orion LXN266, both using Pentium II/266 CPUs and Intel i740–based graphics. Based solely on CPU subsystem performance, on average, from best to worst: Pentium II/300, Pentium II/266, and Pentium II/233; AMD K6/300; Cyrix MII/300; K6/266; Pentium MMX/233 and Pentium MMX/200; and Celeron/266.

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SUMMARY OF FEATURES

Value PCs

System price For PCs sold through resellers, assume that street prices are 15 to 20 percent lower than list prices. Some vendors factor this discount into their quoted prices; in such cases, we indicate that the cited price is a street price. Some vendors sell directly to customers; prices for systems from these vendors are listed as direct and are not discounted. This methodology applies to the prices of the options listed in the features table as well. This price includes only the system; monitor prices are listed separately in the reviews.

Graphics adapter and interface Accelerated Graphics Port (AGP) is a high-speed, point-to-point connection between the system chip set and the graphics chip set. Graphics cards that use AGP can access system memory directly through the system chip set at memory-bus speeds, which are faster than standard PCI connections.

Hard disk Ultra ATA, ATA-3, and ATA-4 drives comply with the Ultra DMA specification, which supports a burst-data throughput of up to 33.3 MBps.

CD-ROM drive speed We list only the maximum speed of each CD-ROM drive.

Free system IRQs IRQs are channels by which hardware peripherals gain access to the CPU. Free IRQs indicate how many channels are open for adding more devices. This is important if you plan to add more hardware or, in some cases, upgrade existing hardware, because two devices can not usually use the same channel.

Each system had at least one mouse, serial, and parallel port.

	Aberdeen Inverness D20	Acer Aspire 1832	ACT EcoPower
System price	$999 direct	$900 street	$849 direct
Processor	Pentium II/333	AMD K6/266	Pentium II/266
Installed SRAM	512K	256K	512K
Hard disk	4.3GB Ultra DMA	5.4GB Ultra DMA	4.1GB Ultra DMA
Modem speed, in Kbps (56K standard)	N/A	56 (K56flex)	N/A
Motherboard chip set	Intel 440LX	ALi M1531	Intel 440LX
Graphics adapter and interface	ATI Xpert 98 AGP	Integrated PCI	Expert Color AGP
Graphics chip set	ATI 3D Rage Pro	ATI 3D Rage II + DVD	S3 ViRGE GX2
Memory	4MB SDRAM	2MB SDRAM	4MB SGRAM
MPEG-2 support	Hardware	Hardware	N/A
Monitor (measured diagonal size, in inches)	ViewSonic OptiQuest VQ51 (13.7)	Acer AcerView 54e (13.8)	Axion CL-1566 (13.8)
CD-ROM drive speed	32X	24X	32X
Sound	N/A	Integrated Crystal	Creative Labs Sound Blaster AWE64
Audio synthesis	N/A	FM	FM, wavetable
Expandability			
Expansion-bus slots	1 ISA, 4 PCI, 1 ISA/PCI, 1 AGP	3 ISA, 2 PCI, 1 ISA/PCI, 0 AGP	2 ISA, 3 PCI, 1 ISA/PCI, 1 AGP
Front-accessible drive bays (5.25" / 3.5")	3 / 2	3 / 1	3 / 2
Internal drive bays (5.25" / 3.5")	0 / 2	0 / 2	0 / 2
USB ports/free system IRQs	2 / 2	2 / 3	2 / 1
Service and Support			
Technical-support hours (eastern time)	11:00–8:00 M–F	24 hours, 7 days	1:00 P.M.–8:00 P.M. M–F
Restocking fee	None	None	First 30 days, none; next 30 days, 15%; no returns thereafter
Standard warranty on parts/labor	1 year/1 year	1 year/1 year	1 year/1 year
On-site service charge	N/A	Included (90 days)	$159.95 (4 years)

N/A—Not applicable: The product does not have this feature.

This DMI 2.0–compliant system is easy to service, and has a motherboard map in the system case. Its motherboard slides out easily and includes an AGP slot for graphics card upgrades, but not every AGP card will fit into the space allotted in the backplane. Digital received an even mix of average and above-average results on our Service and Reliability Survey.—*RSA*

DMI Computers Value 100

Pentium MMX/233, 2.4GB disk, 15" monitor ($159), 32MB EDO DRAM. Winstone: 15.6. $759 direct. DMI Computers Inc., 800-275-5700, 440-349-0444; www.dmi-computer.com; 543 at www.pcmag.com/infolink.

● One of only three Pentium MMX systems in this roundup, the DMI Value 100 is a very inexpensive machine in a roundup of inexpensive machines. This mini-tower consists mostly of aging surplus hardware; you'll find better options elsewhere.

Like many systems circa 1995, it uses a Baby AT motherboard. Each SIMM slot is filled and only one DIMM slot is available.

Compared with our roundup's AMD K6, Cyrix MII, and Pentium II PCs, the Value 100 was—understandably—below average across our tests. Buyers will find the Value 100's warranty appealing, but there is little else to recommend it. The unit also lacks a modem.—*CM*

DTK APRI-76M/P233

Pentium II/233, 2.5GB disk, 14" monitor ($170), 32MB SDRAM. Winstone: 18.1. $970 street. DTK Computer Inc., 800-289-2385, 626-810-0098; www.dtkcomputer.com; 569 at www.pcmag.com/infolink.

● The DTK APRI-76M/P233, sold through resellers, offers solid 3-D graphics performance and room for future peripherals. It comes with an interesting EZKey EZ-1000 keyboard, which includes CD-ROM control keys, 18 programmable keys, and a removable wrist rest. You'll find room for additional devices but no free IRQs.

The unit's Winstone 98 score was average even for 266-MHz systems, and its 3D WinMark score was well above those of some machines with more robust CPUs. DTK received average scores on our Service and Reliability Survey.—*RSA*

HP Pavilion 3265

Pentium MMX/233, 2.1GB disk, 15" monitor ($350), 32MB SDRAM. Winstone: 12. $800 street. Hewlett-Packard Co., 800-322-4772, 415-857-1501; www.hp.com; 544 at www.pcmag.com/infolink.

● Sold through retail outlets, Hewlett-Packard Co.'s least expensive home unit—the Pavilion 3265—is also our roundup's least impressive performer. Relying on a Pentium MMX/233 with no L2 cache and handling all 3-D tasks in software emulation, this exceptionally small desktop had very low scores on all tests. The unit's highlight is its software bundle, but you'll find

Continues

	AMAX Access 6266	American Multisystems InfoGold PII	Axis Orion LXN266 (PC MAGAZINE EDITORS' CHOICE)	Compaq Presario 2254	CompUSA PC American Pro AP266C	Comtrade Best Buy Pro BP266	CTX/ PC Channel SAK305	CyberMax ValueMax H2	Digital PC 3500 6233LP	DMI Computers Value 100
	$920 direct	$995 direct	$995 direct	$900 street	$849.95 direct	$999 direct	$900 street	$900 direct	$950 street	$759 direct
	Pentium II/266	Pentium II/266	Pentium II/266	AMD K6/266	Celeron/266	Pentium II/266	AMD K6/300	Cyrix MII/300	Pentium II/233	Pentium MMX/233
	512K	512K	512K	256K	N/A	512K	512K	512K	512K	512K
	3GB Ultra DMA	4.3GB Ultra DMA	6.4GB Ultra DMA	4GB	3.2GB Ultra DMA	4.3GB Ultra DMA	4.3GB Ultra DMA	4.1GB Ultra DMA	3.2GB Ultra DMA	2.4GB Ultra DMA
	56 (K56flex)	56 (K56flex)	56 (K56flex)	56 (V.90)	56 (K56flex)	N/A	56 (K56flex)	56 (K56flex)	N/A	N/A
	Intel 440LX	Intel 440LX	Intel 440LX	Intel 430VX	Intel 440LX	Intel 440LX	SiS 5591	ALi M1543 Super TX	Intel 440LX	VIA VT82C585VPX
	Integrated AGP	ATI Xpert@Play AGP	Cardexpert i740 AGP	Integrated PCI	Integrated AGP	Matrox Productiva AGP	Biostar GNV128 AGP	Diamond Stealth 3D 2000 Pro Turbo PCI	Integrated PCI	Apac Multimedia Corp. 375/775 PCI
	ATI 3D Rage Pro	ATI 3D Rage Pro	Intel i740	S3 ViRGE/DX	ATI 3D Rage Pro	Matrox MGA-G100A-D	nVidia RIVA 128	S3 ViRGE/DX	Matrox MGA-1164SG-A	S3 ViRGE/DX
	2MB SGRAM	4MB SGRAM	8MB SDRAM	2MB EDO DRAM	4MB SGRAM	4MB SGRAM	4MB SGRAM	4MB EDO DRAM	2MB SGRAM	2MB EDO DRAM
	Hardware	Hardware	N/A	N/A	N/A	N/A	Software	N/A	N/A	N/A
	Impression 5VX (13.8)	ArtMedia Trinitron TX1864 (14.0)	CTX VL-500 (14.1)	Compaq MV400 (13.2)	CompUSA CPC-5862 (14.1)	AOC 1450 (13.0)	CTX VL-500 (14.1)	CyberMax 1555E (13.6)	Digital 51C (13.8)	Chuntex FX-5100 (13.8)
	32X	32X	32X	32X	39X	32X	23.3X	32X	32X	24X
	Yamaha YMF740	Creative Labs Sound Blaster 16 PnP	Creative Labs Ensoniq AudioPCI	Ensoniq ES1887	Ensoniq ESS Solo 1938	Atrend ATC-6631	Gallant ESS1869	Ensoniq ES1370	N/A	Yamaha 719
	Wavetable	Wavetable	Wavetable	FM	FM, wavetable	FM, wavetable	FM	Wavetable	N/A	Wavetable
	1 ISA, 2 PCI, 0 ISA/PCI, 0 AGP	1 ISA, 4 PCI, 1 ISA/PCI, 1 AGP	2 ISA, 3 PCI, 0 ISA/PCI, 1 AGP	2 ISA, 0 PCI, 1 ISA/PCI, 0 AGP	1 ISA, 1 PCI, 1 ISA/PCI, 0 AGP	2 ISA, 3 PCI, 1 ISA/PCI, 1 AGP	2 ISA, 4 PCI, 0 ISA/PCI, 1 AGP	3 ISA, 4 PCI, 0 ISA/PCI, 0 AGP	0 ISA, 0 PCI, 2 ISA/PCI, 1 AGP	3 ISA, 4 PCI, 0 ISA/PCI, 0 AGP
	2/2	3/2	3/2	1/1	2/3	3/2	3/2	4/1	2/1	2/2
	0/1	0/1	0/1	1/1	0/1	0/1	0/0	0/3	0/1	0/1
	2/1	2/1	2/1	2/1	2/2	2/1	0/2	2/2	2/4	0/1
	24 hours, 7 days	11:00–9:00 M–F	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	10:00–10:00 M–F, 11:00–8:00 Sat.	24 hours, 7 days	24 hours, 7 days	8:00 A.M.–midnight M–F	8:30–5:00 M–F
	None	15%	None	Varies	None	None	None	None	None	10%
	3 years/1 year	1 year/3 years	2 year/3 years	1 year/1 year	3 years/1 year	1 year/1 year	1 year/1 year	3 years/1 year	3 years/1 year	3 years/1 year
	Included	Included	Included	Included (90 days)	Included	$25 (1 year)	N/A	Included	Included	Included

better deals elsewhere. HP did receive high scores across the board on our Service and Reliability Survey, however.

The Pavilion's matching monitor is equipped with integrated speakers. The unit lacks speed but offers serviceable PCI audio, a 56-Kbps modem, and an ample software bundle, including Microsoft Encarta, Money, and Works; Quicken; and an HP online support tool.—*CM*

IBM Aptiva E46

AMD K6/266, 4.1GB disk, 15" monitor ($299), 32MB SDRAM. Winstone: 17.1. $999 street. IBM Personal Computer Co., 800-426-7235 (ext. 4840), 919-517-2430; www.ibm.com/aptiva; 545 at www.pcmag.com/infolink.

● The IBM Aptiva E46, sold through retailers, is aimed at home users and offers more online assistance, documentation, and bundled software than most value PCs. Its software bundle includes Lotus SmartSuite 97, IBM AntiVirus, IBM Update Connector for online software updates, and diagnostics software. IBM also received top scores across the board on our Service and Reliability Survey.

There's enough room for expansion, and the unit's motherboard has an integrated wavetable audio subsystem. The system posted an average score on our Winstone 98 tests for its CPU class. Its 3D WinMark score was also average for its class but low among those of all units tested.—*RSA*

iDOT.com 266LX

Pentium II/266, 4.1GB disk, 15" monitor ($99), 32MB SDRAM. Winstone: 20.6. $999 direct. iDOT.com, 888-388-4368, 512-684-5000; www.idot.com; 546 at www.pcmag.com/infolink.

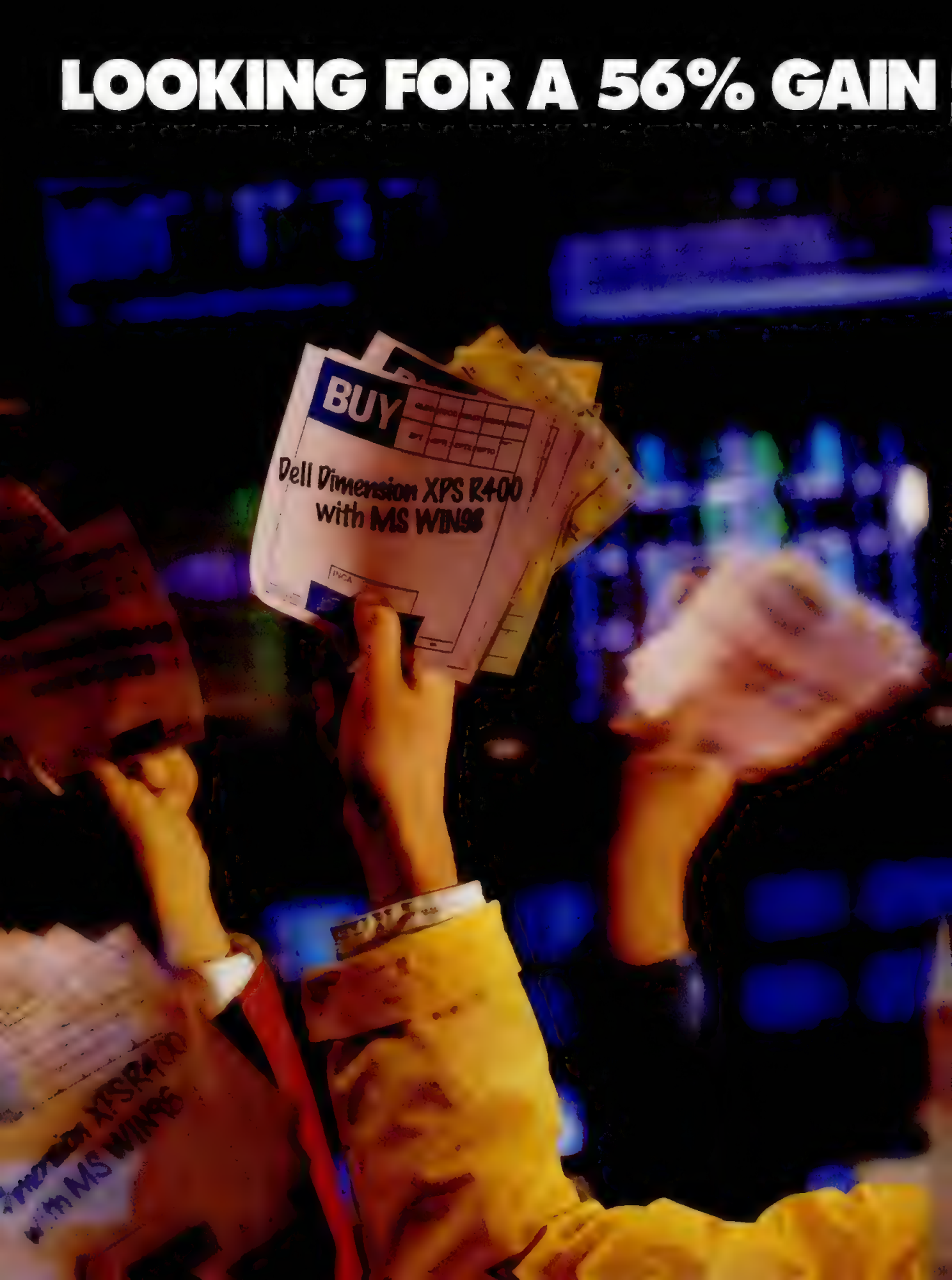
● The leading attribute of the iDOT.com 266LX is its 3-D performance, which was sixth-highest for this roundup and makes it a good choice for entry-level gaming. Performance on other tests was average; the unit is a good value if you don't mind the lack of free IRQs. iDOT.com was founded this year and is the first direct vendor to sell exclusively over the Web.

This mini-tower offers more than just good 3-D. With PCI audio and two external speakers, it provides excellent sound, a rarity for systems in this price class. It also includes an extensive warranty (five years for the CPU and memory, three for all other parts, and one for labor).—*CM*

Mega Computer Optima 300

AMD K6/300, 3GB disk, 15" monitor ($169), 32MB SDRAM. Winstone: 19.2. $799 direct. Mega Computer Systems, 800-338-6628, 619-487-8888; www.megacs.com; 547 at www.pcmag.com/infolink.

● The Mega Optima 300 mini-tower lacks USB ports, an essential feature for today's PCs, and lagged in 3-D graphics performance. It had an average Winstone 98 score for its CPU class and matched the performance of some Pentium II/266 PCs.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- Altec Lansing ACS-90 Speakers
- Microsoft Office 97 Small Business Edition v2.0; McAfee VirusScan
- *NEW* MS Windows 98/MS IntelliMouse
- Dell QuietKey Keyboard
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intel inside pentium II

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SUMMARY OF FEATURES

Value PCs

	DTK APRI-76M/P233	HP Pavilion 3265	IBM Aptiva E46	iDOT.com 266LX	Mega Computer Optima 300	MegaTrends Pegasus	MicroExpress MicroFlex-4500
System price	$970 street	$800 street	$999 street	$999 direct	$799 direct	$999 direct	$899 direct
Processor	Pentium II/233	Pentium MMX/233	AMD K6/266	Pentium II/266	AMD K6/300	Celeron/266	AMD K6/300
Installed SRAM	512K	N/A	512K	512K	512K	N/A	1MB
Hard disk	2.5GB Ultra DMA	2.1GB Ultra DMA	4.1GB	4.3GB Ultra DMA	3GB Ultra DMA	2GB	4.3GB Ultra DMA
Modem speed, in Kbps (56K standard)	N/A	56 (K56flex)	56 (K56flex)	56 (K56flex)	N/A	56 (K56flex)	56 (K56flex)
Motherboard chip set	Intel 440LX	Intel 430TX	ALI M1531	Intel 440LX	Intel 430TX	Intel 440LX	VIA MVP3
Graphics adapter and interface	Cardexpert i740 AGP	Integrated PCI	Integrated PCI	Cardexpert i740 AGP	AOpen PT75 PCI	Matrox Productiva AGP	ATI Xpert@Work AGP
Graphics chip set	Intel i740	ATI 264-VT2	ATI 3D Rage II + DVD	Intel i740	S3 ViRGE/DX	Matrox G100A-B	ATI 3D Rage Pro
Memory	8MB SDRAM	2MB SDRAM	2MB SGRAM	8MB SDRAM	4MB EDO DRAM	8MB SDRAM	4MB SGRAM
MPEG-2 support	N/A	N/A	N/A	N/A	N/A	N/A	Hardware
Monitor (measured diagonal size, in inches)	Lonton Corporion MA-1435 (13.5)	HP M50 (13.8)	IBM 2124 (13.8)	N/A	MGC BM15V (13.9)	OptiQuest Q53 (13.8)	Impression 5VX (13.2)
CD-ROM drive speed	32X	24X	24X	36X	32X	24X	32X
Sound	Creative Labs Sound Blaster 16	Crystal PnP	Crystal CS4237B-KQ	AzTech PCI 338-A3D	Prolink PCI128	Creative Labs Sound Blaster 16	Creative Labs Sound Blaster AWE64
Audio synthesis	FM	Wavetable	FM	Wavetable	Wavetable	FM	FM, wavetable
Expandability							
Expansion-bus slots	2 ISA, 3 PCI, 1 ISA/PCI, 1 AGP	1 ISA, 0 PCI, 1 ISA/PCI, 0 AGP	3 ISA, 2 PCI, 1 ISA/PCI, 0 AGP	1 ISA, 4 PCI, 1 ISA/PCI, 1 AGP	2 ISA, 3 PCI, 1 ISA/PCI, 0 AGP	2 ISA, 3 PCI, 1 ISA/PCI, 1 AGP	2 ISA, 3 PCI, 1 ISA/PCI, 1 AGP
Front-accessible drive bays (5.25" / 3.5")	3 / 2	1 / 1	3 / 1	3 / 2	2 / 2	4 / 2	3 / 2
Internal drive bays (5.25" / 3.5")	0 / 3	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1
USB ports/free system IRQs	2 / 0	2 / 0	2 / 0	2 / 0	0 / 2	2 / 0	2 / 2
Service and Support							
Technical-support hours (eastern time)	8:30–5:30 M–F (each time zone)	24 hours, 7 days	24 hours, 7 days	24 hours, 7 days	8:00–5:00 M–F	24 hours, 7 days	24 hours, 7 days
Restocking fee	None	None	Varies	None	None	Up to 12%	None
Standard warranty on parts/labor	2 years/2 years	1 year/1 year	1 year/1 year	3–5 years/1 year	2 years/2 years	1 year/1 year	4 years/4 years
On-site service charge	$50 (1 year)	Included	Included	Included	N/A	Included	$50 (1 year)

N/A—Not applicable: The product does not have this feature.

A knot of cabling blocks the motherboard's DIMM and SIMM slots, but the hard disk slides out easily, providing a little extra room to work inside. The BCM Advanced Research SQ575G motherboard has a connector for a cable that provides two USB ports; although we received one for testing, it is a $10 extra-cost item.—*RSA*

MegaTrends Pegasus

Celeron/266, 2GB disk, 15" monitor ($199), 32MB SDRAM. Winstone: 17. $999 direct. MegaTrends Technologies Corp., 800-49s5-2955, 401-737-3776; www.megacom.com; 548 at www.pcmag.com/infolink.

● 3-D testing aside, MegaTrends' Pegasus performed well within its CPU class. But at this price, you can get Pentium II–based units with much better performance.

MegaTrends has settled in terms of the CPU as well as the graphics and hard disk. It has chosen a Matrox Productiva AGP card—a cost-cutting option that led to very low 3D WinMark scores—and the system has one of the roundup's smallest disks, at 2GB. The unit also lacks free IRQs.

This system arrived at PC Magazine Labs with an IRQ conflict between its modem and sound card. To test the sound card with the machine's Yamaha speakers, we had to disable the modem.—*CM*

MicroFlex-4500

AMD K6/300, 4.3GB disk, 15" monitor ($150), 32MB SDRAM. Winstone: 20.4. $899 direct. Micro Express, 800-989-9900, 714-852-1400; www.microexpress.net; 549 at www.pcmag.com/infolink.

● Available through resellers, the MicroFlex-4500 mini-tower is configured with some good hardware, and its motherboard is ready to support future processors. The unit is a good value and posted a strong Winstone 98 score for its processor class; its 3D WinMark score was average.

The system's notable hardware includes its motherboard's VIA Apollo MVP3 chip set, which (like Intel's 440BX) supports a 100-MHz system bus and 100-MHz SDRAM. This high-speed bus allows the unit to be upgraded with CPUs such as the AMD K6-2 with 3DNOW!, a chip with instructions that let it enhance some 3-D applications.—*RSA*

MidWest Micro PRH-266

Pentium II/266, 3GB disk, 15" monitor ($169), 32MB SDRAM. Winstone: 18.3. $820 direct. MidWest Micro, 800-728-8582, 937-368-2309; www.mwmicro.com; 550 at www.pcmag.com/infolink.

● MidWest Micro's PRH-266 has some good software and a good price but was a disappointing performer on our 3-D tests. It has an easy-to-open mini-tower chassis and comes with both a modem and a sound

Continues

MidWest Micro PRH-266	Monorail 6020	NETiS BestBuy	nextPC NK6-266	NextTrend NexStar-266L	Polywell Poly 800B8	Premio Apollo Professional System	ProGen Discover3D PII300	SAG STA BX266	SIA P6/266 Advanced Pentium II
$820 direct	$999 street	$945 direct	$839 direct	$989 direct	$988 direct	$824 direct	$859 direct	$999 direct	$987 direct
Pentium II/266	Celeron/266	AMD K6/266	AMD K6/266	Pentium II/266	Pentium II/300	Pentium MMX/200	Pentium II/300	Pentium II/266	Pentium II/266
512K	N/A	512K	512K	512K	512K	512K	512K	512K	512K
3GB Ultra DMA	4 1GB Ultra DMA	3GB	4 1GB Ultra DMA	4 1GB Ultra DMA	4 1GB Ultra DMA	2 4GB Ultra DMA	3GB Ultra DMA	4 1GB Ultra DMA	4 3GB Ultra DMA
56 (K56flex)	56 (x2)	56 (x2)	56 (x2)	56 (x2)	56 (K56flex)	56 (K56flex)	56 (x2)	56 (x2)	56 (x2)
Intel 440LX	Intel 440EX	Intel 430TX	ALI M1541	Intel 440LX	Intel 440BX	ALI M1531	Intel 440LX	Intel 440BX	Intel 440BX
Apac Multimedia SG200A AGP	ECS 3DVision AGP	ATI Mach64 VT PCI	Cardexpert i740 AGP	Intel i740 AGP	Diamond Viper V330 AGP	ATI Videoboost PCI	Atrend ATC-2350 AGP	Real 3D Starfighter AGP	Diamond Stealth 3D 4000 AGP
S3 ViRGE/GX2	SiS 6326	ATI-264VT2	Intel i740	Intel i740	nVidia RIVA 128	ATI 215CT22200	S3 ViRGE/GX2	Intel i740	S3 ViRGE/GX2
4MB SGRAM	4MB SGRAM	4MB DRAM	8MB SDRAM	8MB SGRAM	4MB SGRAM	2MB EDO DRAM	4MB SGRAM	8MB SDRAM	4MB SGRAM
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MAG VD0512 (14.0)	KDS M-150 (13.8)	Sampo KW-511 (14.2)	CTX VL-500 (14.1)	CTX VL-500 (14.1)	Proview Electronics AV6S (13.8)	Sceptre H566 (13.5)	ProGen P-515 (14.0)	CTX VL-500 (14.1)	ViewSonic 15GA (14.3)
32X	32X	32X	32X	32X	36X	32X	36X	36X	32X
Creative Labs Ensoniq AudioPCI	OPTi 82C933	Creative Labs Sound Blaster 16	AzTech PCI 338-A3D	Yamaha YMF715	Integrated ES 1371	Behavior Tech ESS1868	Aureal Vortex A3D	OPTi Audio 16	Integrated Crystal
Wavetable	Wavetable	FM	Wavetable	Wavetable	Wavetable	Wavetable	Wavetable	FM	FM
1 ISA, 4 PCI, 1 ISA/PCI, 1 AGP	1 ISA, 1 PCI, 1 ISA/PCI, 1 AGP	2 ISA, 3 PCI, 1 ISA/PCI, 0 AGP	2 ISA, 3 PCI, 1 ISA/PCI, 1 AGP	1 ISA, 1 PCI, 1 ISA/PCI, 1 AGP	1 ISA, 4 PCI, 1 ISA/PCI, 1 AGP	3 ISA, 3 PCI, 1 ISA/PCI, 0 AGP	1 ISA, 2 PCI, 1 ISA/PCI, 1 AGP	3 ISA, 3 PCI, 1 ISA/PCI, 1 AGP	1 ISA, 3 PCI, 1 ISA/PCI, 1 AGP
3 / 2	2 / 1	2 / 2	3 / 2	2 / 2	3 / 2	3 / 2	3 / 2	3 / 2	3 / 2
0 / 2	0 / 2	0 / 3	0 / 2	0 / 1	0 / 1	0 / 3	0 / 1	0 / 2	0 / 2
2 / 1	2 / 0	2 / 1	2 / 0	2 / 0	2 / 2	2 / 2	2 / 0	2 / 0	2 / 0
9:00–9:00 M–F, 10:00–4:00 Sat.	10:00–10:00 M–F	11:00–8:00 M–F	24 hours, 7 days	24 hours, 7 days	11:00–9:00 M–F	11:00–8:30 M–F	11:00–8:00 M–F	24 hours, 7 days	10:00–6:00 M-F
None	None	15%	First 30 days, none, price varies thereafter	First 30 days, none, price varies thereafter	15%	20%	None	20%	25%
3–5 years/3 years	1 year/1 year	1 year/1 year	3 years/1 year	3 years/1 year	3 years/5 years	3 years/3 years	1 year/1 year	3 years/3 years	3 years/3 years
Included	N/A	Included (SF Bay Area only)	Included	Included	$75 (1 year)	$75 (1 year)	$79 (1 year)	$40 (1 year)	$50 (1 year)

card, which provides adequate audio. The unit's Microsoft Home Essentials bundle includes Word, Works, Money, Encarta, and several entertainment CDs.

The unit's 3D WinMark score was well below average, a reflection of its Apac AGP card. (By the time you read this, MidWest Micro will be using an STB card.) The company received an even mix of average and above-average scores on our Service and Reliability Survey.—*CM*

Monorail 6020

Celeron/266, 4.1GB disk, 15" monitor ($199), 32MB SDRAM. Winstone: 14.5. $999 street. Monorail Computer Corp., 800-880-7245, 770-421-1102; www.monorail.com; 551 at www.pcmag.com/infolink.

● Available through resellers, the Monorail 6020 is a full-featured value PC, but performance was lacking. The unit had the lowest Winstone 98 score among Celeron PCs, which in turn were this roundup's weakest performers. (The unit now ships with a 300-MHz Celeron.) Its 3D WinMark score was average for its class, however.

Among its interesting features is the Monorail Multimedia keyboard, manufactured by Lite-On. The keyboard has 13 "hot buttons," including CD-ROM control keys, a volume button, a standby button, and application quick-start keys. The ECS 3DVision 6326 AGP graphics card includes NTSC and S-Video–out ports. The unit lacks free IRQs, though.—*RSA*

NETiS BestBuy

AMD K6/266, 3GB disk, 15" monitor ($180), 32MB EDO DRAM. Winstone: 17.4. $945 direct. NETiS Technology Inc., 800-577-7526, 408-263-0368; www.netistech.com; 552 at www.pcmag.com/infolink.

● The NETiS BestBuy is somewhat overpriced given its components and average performance. Like the four other 266-MHz AMD K6 machines reviewed here, the BestBuy's benchmark test results were slightly slower than those of its 266-MHz Pentium II counterparts; it also trailed the rest of the K6 pack, however. Because of the lack of a Direct3D Hardware Abstraction Layer (HAL), the unit's 3D WinMark score was one of the poorest, so it is unsuitable for gaming.

As with many Socket 7 machines here, the NETiS offering uses a Baby AT motherboard with a complement of both SIMM and DIMM memory technology. Two of its four SIMMs are taken; both DIMMs are unused. NETiS equips the machine with 512K of L2 cache, a sound card, and a modem. The warranty provides only a single year of support.—*CM*

SUMMARY OF FEATURES See www.pcmag.com for interactive views

Value PCs

Ends

	Sys Performance Pro 300P	Tagram Thunderbolt VZ300	Tiger K-Series 300	Total Peripherals Serengeti	Unicent Avanta E266	Unitek UT-PII266 Courier	Zeson 3D Power Pro
System price	$995 direct	$814 direct	$800 direct	$936 direct	$849 direct	$899 direct	$850 direct
Processor	Pentium II/300	Pentium II/300	AMD K6/300	Pentium II/266	Celeron/266	Pentium II/266	Celeron/266
Installed SRAM	512K	512K	1MB	512K	N/A	512K	N/A
Hard disk	4.3GB Ultra DMA	4.1GB Ultra DMA	4.3GB Ultra DMA	4.1GB	2GB	4.1GB Ultra DMA	4.1GB Ultra DMA
Modem speed, in Kbps (56K standard)	N/A	56 (K56flex)	56 (K56flex)	56 (K56flex)	56 (K56flex)	N/A	56 (K56flex)
Motherboard chip set	Intel 440LX	Intel 440LX	VIA MVP3	Intel 440LX	Intel 440LX	Intel 440LX	Intel 440LX
Graphics adapter and interface	Matrox Millennium II AGP	Matrox G200 AGP	STB Velocity 128 AGP	ECS 3DVision 6326 AGP	Matrox Productiva AGP	Diamond Viper V330 AGP	Prolink AGP-7400 AGP
Graphics chip set	Matrox MGA-2164W	Matrox G200	nVidia RIVA 128	SiS 6326	Matrox MGA-G100A-D	nVidia RIVA 128	Intel i740
Memory	4MB WRAM	8MB SGRAM	4MB SGRAM	4MB SGRAM	8MB SGRAM	4MB SGRAM	4MB SDRAM
MPEG-2 support	N/A	N/A	Hardware	N/A	N/A	N/A	N/A
Monitor (measured diagonal size, in inches)	KDS SPM-15-MS (14.0)	MAG 510V2 (14.3)	TigerDirect VS-5 (13.8)	Imagic S72L-1 (14.1)	CyberVision C50 (13.8)	ViewSonic 1569GA-2 (13.8)	CyberVision C50 (13.8)
CD-ROM drive speed	33X	32X	32X	32X	32X	24X	24X
Sound	Creative Labs Sound Blaster 16 Value PnP	Yamaha 719	Yamaha OPL3-SA-X	Creative Labs Sound Blaster AWE64	Yamaha YMF-715E-S	Yamaha OPL3-SA-X	AzTech SC128-3D
Audio synthesis	FM	Wavetable	Wavetable	Wavetable	Wavetable	Wavetable	Wavetable
Expandability							
Expansion-bus slots	2 ISA, 3 PCI, 1 ISA/PCI, 1 AGP	2 ISA, 0 PCI, 4 ISA/PCI, 1 AGP	1 ISA, 4 PCI, 1 ISA/PCI, 1 AGP	2 ISA, 3 PCI, 1 ISA/PCI, 1 AGP	1 ISA, 1 PCI, 1 ISA/PCI, 1 AGP	1 ISA, 3 PCI, 1 ISA/PCI, 1 AGP	2 ISA, 3 PCI, 1 ISA/PCI, 1 AGP
Front-accessible drive bays (5.25" / 3.5")	3 / 2	4 / 2	3 / 2	3 / 2	2 / 2	3 / 1	3 / 2
Internal drive bays (5.25" / 3.5")	0 / 3	0 / 1	0 / 0	0 / 1	0 / 1	0 / 1	0 / 2
USB ports/free system IRQs	2 / 1	2 / 0	2 / 2	2 / 1	2 / 0	2 / 0	2 / 1
Service and Support							
Technical-support hours (eastern time)	24 hours, 7 days	24 hours, 7 days	8:00 A.M.–midnight M–Sat.	9:00–9:00 M–F (each time zone)	24 hours, 7 days	11:30–8:30 M–F	10:00–10:00 M-F, 1:00–6:00 Sat.
Restocking fee	First 7 days, none; next 23 days, 15%; no returns thereafter	First 30 days, none; 25% thereafter	None	Up to 15%	None	15%	None
Standard warranty on parts/labor	Varies/5 years	3 years/3 years	1 year/1 year	3 years/1 year	3 years/1 year	1 year/1 year	1 year/1 year
On-site service charge	Included	$30 (1 year)	Included	$89 (1 year)	Included	$75 (1 year)	$35 (1 year)

N/A—Not applicable: The product does not have this feature.

nextPC NK6-266

AMD K6/266, 4.1GB disk, 15" monitor ($160), 32MB SDRAM. Winstone: 18.2. $839 direct. nextPC, 888-838-7827, 510-659-8500; www.next-pc.com; 553 at www.pcmag.com/infolink.

● Even though it's one of the lowest-priced units in this roundup, the nextPC NK6-266 offers ample expansion room as well as solid 3-D graphics performance. The unit posted the best 3D WinMark score by far in its CPU class, thanks to its Cardexpert i740 AGP graphics card, which includes 8MB of SDRAM and an Intel i740 graphics chip set. The unit's Winstone 98 score was average for its class.

The midtower case comes with five open drive bays; three of four PCI slots and two of three ISA slots are free for extra peripherals. There are no available IRQs, however. An Aztech PCI 338-A3D card provides wavetable sound, with the Aureal Vortex chip set supporting 3-D audio. Also included are a pair of bookshelf speakers, an E-Tech 56-Kbps fax modem, and McAfee PC Medic 97 and VirusScan.—*RSA*

NexTrend NexStar-266L

Pentium II/266, 4.1GB disk, 15" monitor ($170), 32MB SDRAM. Winstone: 20.6. $989 direct. NexTrend Technology Inc., 877-833-8833, 510-659-8500; www.nextrendpc.com; 554 at www.pcmag.com/infolink.

● Outfitted with Intel's i740 AGP graphics chip set—which is perhaps the leading solution in the low-cost PC market—NexTrend's value configuration distinguished itself with the second-highest 3D WinMark score in this roundup, so it's a good bet for entry-level gaming. As a 266-MHz unit competing against 300- and 333-MHz systems, it posted admirably competitive scores on all other tests. It lacks any free IRQs for adding new peripherals, however.

Furnished with an on-board Yamaha sound chip, two modest speakers, and a 56-Kbps modem, this well-stocked PC is brought down only by its cramped chassis and limited expansion options. Bundled software includes McAfee VirusScan and a copy of PC Medic; the warranty covers parts for three years and labor for one year.—*CM*

Polywell Poly 800B8

Pentium II/300, 4.1GB disk, 15" monitor ($178), 32MB SDRAM. Winstone: 22.7. $988 direct. Polywell Computers Inc., 888-999-1278, 650-583-7222; www.polywell.com; 555 at www.pcmag.com/infolink.

● The Polywell Poly 800B8 offers admirable 3-D graphics performance and an impressive level of component integration. Thanks to its Diamond V330 AGP graphics card—based on nVidia's RIVA 128 chip set and loaded with 4MB of

FOCUS ON YOUR CUSTOMER

Customer-focused, customer-driven. Over the past decade, the giants of Corporate America have made the customer their strategic centerpiece, investing huge sums in information technology to help them improve their customer relationships.

And, what they've been saying is, 'We have to start treating our customers like small businesses do...with the same personal attention to their needs and the same ability to customize a product or a service.'

While big businesses are using technology to play catch up with companies with one, five, ten, or 20 employees, small businesses all over the world are finding out they can use those same solutions to build their advantage.

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Software solutions can help small businesses serve their customers better than ever, while at the same time helping them improve their own productivity. There are software solutions that not only put the power of information technology at their fingertips, but also protect customers from the problems that systems can cause.

Symantec has spent nearly two decades providing such solutions to individuals, businesses and other institutions around the world, making them more productive and keeping their computers safe and reliable — anywhere, anytime.

"With such revolutionary developments as corporate downsizing, computing and the Internet, the number of small businesses around the world has exploded," says Symantec's Dana Siebert, VP, Americas. "This is great because small businesses have always been a major source of innovation and service. A primary goal for companies like ours has to be to help level the playing field for them and contribute to their growth.

"What we're saying here is they have an advantage — their understanding of and responsiveness to their customers — and we think we can help them keep it."

Be understanding, responsive, productive and protective. This is what being customer-driven is all about.

The Touch and Feel of Technology

What does it mean to be customer-focused and customer-driven? How can technology give you more touch and feel when it comes to your customers?

Understanding

Customer-driven means that a business offers its customers products and services they really need, rather than presenting "a product in search of a market." The price is right; the packaging and shipping is the way they want it; their operation is 24 hours a day, so your support is too. The best businesses are the ones that understand their customers well enough not only to see all this, but also to see what's coming around the bend.

It's never been an easy task. You need to know your customer base by market or geographic segment, but that's not enough. You need to know your customers individually and they need to feel that you do — that you know their business, you know their company, and you know them as people.

For instance, to create winning proposals over and over again, you want your customer's plans and the history of your relationship at your fingertips. We're not only talking volume, credit history, and the bottom line, but also the interpersonal relationship-the nuances of how you have worked together.

Technologically, both the top-down planning and the individual interaction require a customer database: an information file on your customers and their accounts — the notes, the phone discussion logs, the presentations and proposals.

As your company grows, software tools can help you maintain the professionalism and personal touch you've been known for, reminding you and your staff about important customer dates and events — from appointments and scheduled services or product updates to birthdays and anniversaries.

Responsiveness

Responsiveness on a day-to-day basis says you provide customers with the answers they need when they need them. That can translate into a variety of things. For instance, for the sales and service people, instant access to customer records is vital. A user-friendly database, one your staff can query easily, is the first need. But access can also be speeded by technology that, for instance, enables caller ID to bring up the record before the sales or service person says "good morning."

It doesn't matter what information your customer needs and how fast, there's a communication vehicle for getting it there and you have to use it all: email, voice mail, fax, overnight delivery. For instance, computer-to-fax is the fastest way to get your customers hard copy, whether they are in their office, hotel room, or car. We're talking about documents you send from your computer that might contain a just-assembled combination of the latest promotions, product illustrations, and — from the customer database — the customer's current product configuration.

Productivity

Being able to provide your customers with better products and ever higher levels of service, being

able to develop and retain close relationships with individual customers as your customer base grows — all this carries a cost to your business. You can't stay customer-driven as we've described if your resources are strained and your bottom line suffers.

The technology solutions we've noted above — the customer and prospect database, word processor, email messaging and other communications tools such as computer-to-fax, and the calendar — are also crucial productivity tools for your organization, allowing them to be responsive to customers literally at the push of a button.

To improve ease-of-use, while safeguarding your investment in new and older computing equipment, such tools must all operate on all major computing platforms.

These tools are win-win solutions for the front lines of your business — the people who plan and deliver what the customer needs. You also need technology that protects your business and your customer's, and solutions exist for your back office to provide these safeguards.

Protection

Flash...computers are vulnerable and fallible. They crash, wiping out that 10-page proposal you hadn't saved. They can get viruses. Installing new programs can mess up your system. Worse, you can wipe out data on your customer. And, electronically connected to your customers, you can send them a virus that wreaks havoc on their systems.

The good news is that technology solutions exist to fend off these problems.

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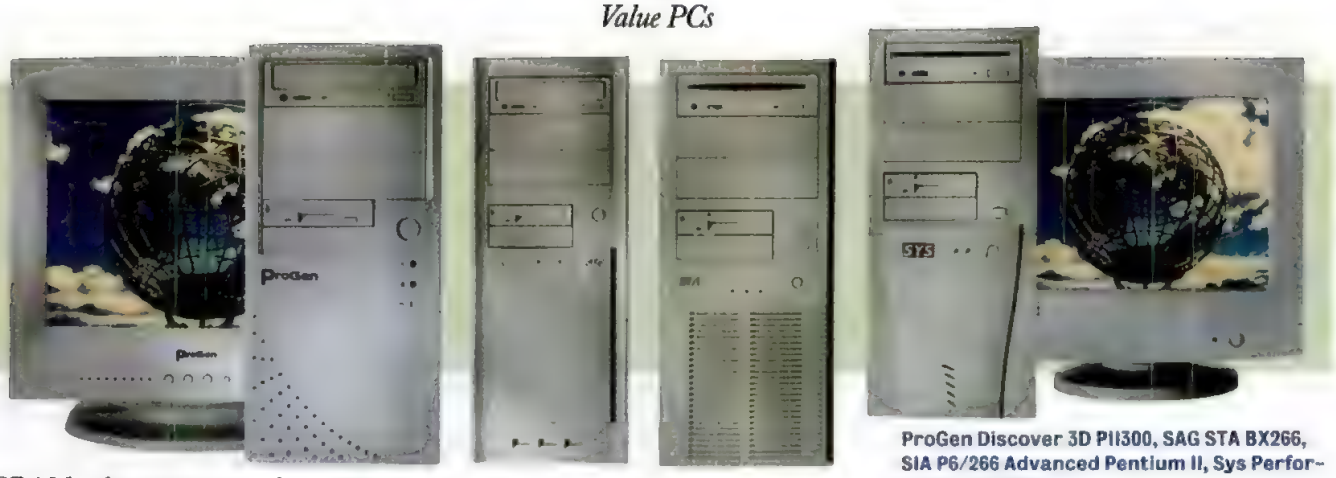

ProGen Discover 3D PII300, SAG STA BX266, SIA P6/266 Advanced Pentium II, Sys Performance Pro 300P.

SGRAM—the system posted a very good 3D WinMark score, so it's a good option for entry-level gaming. The unit also has an integrated wavetable audio subsystem from Ensoniq, leaving four of five PCI slots free for other components. The 15-inch monitor integrates side-mounted speakers and a microphone jack.

The Tyan ATX motherboard uses Intel's 440BX chip set, which lets you upgrade to a 350-MHz or faster CPU and use 100-MHz SDRAM memory. A Diamond Multimedia V.90i 56-Kbps fax modem is also included.—*RSA*

Premio Apollo Professional System

Pentium MMX/200, 2.4GB disk, 15" monitor ($144), 32MB SDRAM. Winstone: 13.9. $820 street. Premio Computer Inc., 800-677-6477, 626-839-3100; www.premiopc.com; 556 at www.pcmag.com/infolink.

● The Premio Apollo Professional System is a throwback: It's built like a typical sub-$1,000 system of a year ago, not like the more evolved value models of today. One of three Pentium MMX machines in our roundup—and the only entry to run as slow as 200 MHz—this small-business system turned in the second-lowest Winstone score and a similarly poor $CPUmark_{32}$ result. Compared with the other Pentium MMX–based systems, the unit showed average performance. By forgoing a Direct3D Hardware Abstraction Layer (HAL), Premio has also doomed the machine to the roundup's poorest 3D WinMark performance. Its hard disk was one of the smallest in this roundup.

Premio makes the package more attractive by including a 56-Kbps modem, an ISA audio card, two stereo speakers, and a three-year warranty. But better values are found elsewhere in this roundup.—*CM*

ProGen Discover3D PII300

Pentium II/300, 3.2GB disk, 15" monitor ($140), 32MB SDRAM. Winstone: 21.3. $859 direct. ProGen Systems, 800-848-1353, 714-566-9200; www.progen.com; 557 at www.pcmag.com/infolink.

● The ProGen Discover3D PII300 offers reasonable expansion space—but lacks free IRQs—and has mostly average performance for its CPU class. The unit comes with a Baby AT–style motherboard. These are a rarity; today's systems almost always use ATX-style boards, which offer more space on the backplane for integrated ports. Expansion is possible, since two of three PCI slots and five of eight drive bays are open. Portions of the motherboard are crowded by drive cabling, however.

A GVC wavetable sound board with an Aureal Vortex 3D audio chip set, an Aztech 56-Kbps voice modem, a pair of bookshelf speakers, and a Microsoft ergonomic keyboard were included with the unit. It posted an average Winstone 98 score for its CPU class, but its S3 ViRGE GX2-based AGP graphics card posted a below-average 3D WinMark score.—*RSA*

SAG STA BX266

Pentium II/266, 4.1GB disk, 15" monitor, ($299), 32MB SDRAM. Winstone: 19.7. $999 direct. SAG Electronics, 800-989-3475, 978-683-0339; www.sagelec.com; 559 at www.pcmag.com/infolink.

● The SAG STA BX266 provides average performance for its CPU class, and its tall tower case with five open drive bays offers the room you need for expansion. It has no free IRQs, though. Configured with a Real3D StarFighter AGP graphics board—loaded with an Intel i740 graphics chip set and 8MB of SDRAM—the system also has a U.S. Robotics 56-Kbps fax modem.

Although SAG includes a 16-bit OPTi FM sound board, there are no bundled speakers. Still, all four PCI slots on the SuperMicro P6SBA ATX motherboard are free for new cards. The software bundle includes Iris Software's AntiVirus Plus and the telephone-number lookup service PC411.—*RSA*

SIA P6/266 Advanced Pentium II

Pentium II/266, 4.3GB, 15" monitor ($299), 32MB SDRAM. Winstone: 20. $987 direct. SIA Computer Corp., 815-678-2224; www.siacomputer.com; 560 at www.pcmag.com/infolink.

● A first-time buyer might enjoy the P6/266 Advanced Pentium II, from SIA. Unlike some of the other systems in this roundup, it comes with an abundance of system manuals, Microsoft Works, and a game: F-22 Air Dominance Fighter. The 15-inch ViewSonic monitor has integrated speakers on either side of the display. They provide adequate sound, but you may want to purchase standalone speakers.

The system offers internal expansion room for cards and drives but lacks free IRQs. The inside of the case is uncluttered, and sticker diagrams guide you to all ports, motherboard components, and jumper settings. The unit was an average performer for its class on our Winstone and $CPUmark_{32}$ tests but received a below-average score on the 3D WinMark tests, so it's unsuitable for playing 3-D games.—*Angela Tuka*

Sys Performance Pro 300P

Pentium II/300, 4.3GB, 15" monitor ($159), 32MB SDRAM. Winstone: 24.1. $995 direct. Sys Technology Inc., 800-613-9963, 714-821-3900; www.systechnology.com; 561 at www.pcmag.com/infolink.

● If you're looking for a reasonable home machine, the Sys Performance Pro 300P's speed, 32X CD-ROM, speakers, and 16-bit sound card will handle most

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Tiger K-Series 300, Total Peripherals Serengeti.

of your needs. Sys Technology has to cut costs somewhere, though: The unit lacks a modem. It is DMI 2.0–compliant and thus prepared for a corporate environment. Aside from top-of-the-line components, Sys provides five free drive bays, three free DIMM slots, and six free card slots for expansion, as well as one free IRQ.

Though most of the system's performance was good, it floundered on our 3D WinMark tests. Its Matrox Millennium II AGP graphics card, though effective on 2-D graphics tasks, did not handle 3-D functions well; this is not a game machine. If you get a unit with an Ultra ATA disk, make sure the control panel is set to take advantage of the feature. (The unit we tested arrived with the setting turned off.)—*AT*

Tagram ThunderBolt V2300

Pentium II/300, 4.3GB, 15" monitor ($175), 32MB SDRAM. Winstone: 22.8. $814 direct. Tagram Systems Corp., 800-898-5701, 714-979-8900; www.tagram.com; 562 at www.pcmag.com/infolink.

● If you are looking for a speedy processor and a robust graphics card, check out the ThunderBolt V2300. The unit offers a Pentium II/300 CPU and an 8MB Matrox Millennium AGP card (one of eight in the roundup with 8MB) for under $1,000. The trade-off is the less well-known audio parts and 56K modem, plus a lack of free IRQs.

The unit's case and motherboard offer expansion room, with five free PCI slots and four open drive bays. The software bundle is light: Only Windows 95 is included. The ThunderBolt did well on our benchmark tests, however: It not only achieved average scores on the Winstone and CPUmark$_{32}$ tests but also posted an above-average score for this roundup on the 3D WinMark test, so it's a good entry-level gaming system.—*AT*

Tiger K-Series 300

AMD K6/300, 4.3GB disk, 15" monitor ($159), 32MB SDRAM. Winstone: 20.1. $800 direct. TigerDirect Inc., 800-830-0056, 305-229-1119; www.tigerdirect.com; 564 at www.pcmag.com/infolink.

● Housed in a midtower chassis, the Tiger K-Series 300 is a system that delivers reasonable power through good components and has adequate expandability. With average to above-average scores for its CPU class, it fits into its target niche, small-office and home machines.

The system has a good software bundle for its intended market: Users get both Corel Office Suite 8 and Microsoft Home Essentials. The system is easy to upgrade, though no extra ISA slots were available on our tested unit. One disappointment is that although USB ports are on the system, the drivers to support them are not. The unit ships with an easy-to-follow setup guide, and users who need more assistance can pay $99 for a technician to come and set it up. Personal computer training is also available.—*Frank J. Evans*

Total Peripherals Serengeti

Pentium II/266, 4.1GB disk, 15" monitor ($189), 32MB SDRAM. Winstone: 18.6. $936 direct. Total Peripherals Inc., 800-923-7718, 508-393-1777; www.totalpc.com; 565 at www.pcmag.com/infolink.

● A general-purpose machine, the Serengeti comes with few extras. Thanks to its Pentium II/266 processor, however, the unit was a reasonable performer, scoring within the average range for its processor class on all benchmark tests.

The mini-tower provides plenty of expansion room and easy accessibility to all the cards. Most of the unit's components are adequate, with the exception of the hard disk, a Quantum Bigfoot, which runs at just 3,600 rpm (most disks run at 5,400 rpm or faster). Nevertheless, the

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Unitek UT-PII266 Courier, Zenon 3D Power Pro.

Serengeti comes with a great audio system, based on a Sound Blaster AWE64 card. Large speakers give clear sound, and a pair of headphones is provided for quieter times. Watch out for the restocking fee, though: If you return the system, the fee can be as high as 15 percent of system costs.—*FJE*

Unicent Avanta E266

Celeron/266, 2GB disk, 15" monitor ($169), 32MB SDRAM. Winstone: 16. $849 direct. Unicent Technologies, 800-731-6526, 216-344-2649; www.unicent.com; 566 at www.pcmag.com/infolink.

● A mostly average performer with some excellent components, the Unicent Avanta E266 is hampered by its cramped case, limited hard disk storage, poor 3-D WinMark performance, and lack of expandability (including a lack of free IRQs). Targeted for the corporate and small-business markets, it ships with Microsoft Office 97 Small Business Edition.

Documentation is excellent, and a customized binder helps users navigate the system. Because of its cramped, squat mini-tower design, the unit is difficult to service. We experienced this firsthand when adjusting our test unit's floppy disk drive, which did not work when the system arrived. Still, the monitor is clear and the speakers provided are very good.—*FJE*

Unitek UT-PII266 Courier

Pentium II/266, 4.1GB disk, 15" monitor ($299), 32MB SDRAM. Winstone: 20.6. $899 street. Unitek Technology Inc., 800-336-6163, 909-930-5700; 567 at www.pcmag.com/infolink

● Marketed as a business system for the office, the Unitek UT-PII266 Courier comes in a squat mini-tower case and features an Intel Ethernet adapter. A strong performer in its processor class, the unit nevertheless lacks significant amenities, such as free IRQs for new components. It also comes without extras, manuals, or drivers; for example, though USB ports are included, the necessary software support was not installed. Upgrading the system is also difficult because the power supply blocks access to the memory and the CPU.

Still, the ViewSonic monitor—not included in the sub-$1,000 system price—is excellent, and its integrated speakers reduce desktop clutter. Unfortunately, Unitek has no Web site, so customer support is limited to the telephone. Performance was mostly average for the unit's class, excepting its above-average 3D WinMark scores.—*FJE*

Zenon 3D Power Pro

Celeron/266, 4.1GB disk, 15" monitor ($150), 32MB SDRAM. Winstone: 15.5. $850 direct. Zenon Computer Systems Inc., 800-899-6119, 626-935-1860; www.zenontech.com; 568 at www.pcmag.com/infolink.

● The 3D Power Pro from Zenon is designed as an entry-level game machine. Although its Celeron CPU may not be up to serious gaming levels, its i740-based 8MB AGP graphics card let it garner top scores on our 3D WinMark test. The unit's other scores were average compared with machines that have the same type of CPU. But Celeron-based systems are usually poor Winstone performers.

Although Zenon includes an Ultra-ATA hard disk, this mode was not enabled on the system we tested; change control panel settings to make sure you take advantage of the disk's potential. The monitor and speakers we received provided a clear picture and acceptable sound. Experienced gamers will want a more powerful machine, but Zenon provides an adequate package for entry-level users.—*FJE* PC

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You Can Get

Ever wish you could be in two places at once? Remote-control software can't solve that problem, but it can help you to be in two PCs at once. Using a remote-control program, you can access a PC remotely to exchange files between systems, run applications, take over a client PC or server to troubleshoot a problem, and much more.

Remote-control software is an application that you install on two PCs that permits one system (the guest) to connect with and control another (the host). Once you're connected, you can do just about anything as if you were sitting at the host PC. In addition, remote-control software lets you transfer files between PCs faster and more efficiently.

The latest remote-control programs support a myriad of connection types including Internet connections, which are becoming increasingly important. The key advantage to Internet connections is that they let mobile users connect to a PC or server anywhere on the globe via an inexpensive local telephone call. So no matter where you are, you can always stay in touch.

BY STEVE RIGNEY

In this roundup, we review eight remote-control programs. A few products did not meet our criteria for a full review and are covered in the sidebar "Other Avenues for Remote Access." These include Norton-Lambert's Close-Up, Funk Software's Proxy, and Netopia's Timbuktu Pro.

Most users associate remote-control software with telecommuting or day extending. Telecommuters typically use remote-control software to connect to an office PC over an analog phone line to exchange files and access productivity applications.

But there are many other uses for remote-control technology. For example, in a corporate setting, a help desk administrator can take over a client PC and show a worker how to accomplish a task or fix a problem.

Review Criteria The eight products in our main story provide remote-control and file-transfer features. They can be used in a range of applications including telecommuting, help desks, system administration, and customer support. To qualify for a review, each product must also: • **provide 32-bit guest and host clients • operate under Windows 95 and Windows NT, at a minimum • support modem-to-modem connections. Each of the products also supports other types of connections including network, Internet, and dial-up networking.**

THE FOUR ROLES OF REMOTE-CONTROL SOFTWARE

1 CORPORATE HELP DESK

Remote-control software lets help-desk administrators troubleshoot problems without having to run all over the building. Help-desk administrators look for strong remote-control performance—plus features such as tools for pushing the host software down to client PCs for easy installation, and the ability to launch the host module remotely.

2 SYSTEM ADMINISTRATOR

By using remote-control software, system administrators no longer need to be chained to their desks. A system administrator can monitor servers and correct problems at any time of the day from any location. One of the key features is the ability to monitor multiple hosts.

There from Here

Network administrators use remote-control software to connect with a Windows NT server and troubleshoot a problem without making the long trek to the server room. And many major computer vendors put remote-control software on their PCs so that they can provide customer support remotely. Our testing was designed to take all of these applications into account.

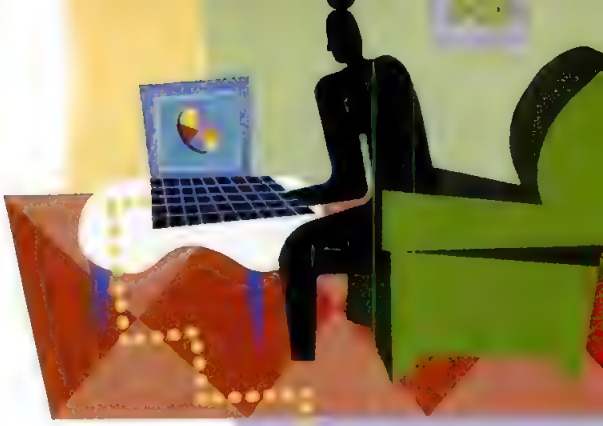
In general, these products were easy to install and configure, especially for network administrators. Most programs install the host and guest software in a single step; a few require you to install them separately. After installation, the program recognizes your modem (if you're using one), and most provide wizards that walk you through the process of configuring connections and adding new users.

All of the programs in this roundup let you resize the host screen to fit the guest's screen and disable the wallpaper and screen saver on the host PC. Another trick used to increase performance is to reduce the number of colors in a bitmap. More innovative features include voice chat over data and the ability to connect a single guest PC to multiple hosts—for monitoring multiple servers at once, for example.

One of the most common uses of remote-control programs is to transfer files to and from a remote PC and to keep files and folders on multiple PCs in sync. Delta file transfer, which copies only changed portions of files, and compression speed up file transfers.

But be aware that not all products deliver true delta file transfers: CrossTec's NetOp uses a modified delta file transfer that provided no real performance boost on our tests; Stac's ReachOut Enterprise 8.0 failed to execute delta file transfers properly because of a bug in the program. In addition to scripting, most programs provide wizards for creating file-transfer routines that can be invoked on a schedule.

To gauge the software's performance on both remote-control and file transfers, we conducted a



TELECOMMUTER

Connecting over the Internet or dialing in to a company network, a telecommuter can take over a host system (usually, a desktop PC), as though sitting at a desk. Key features for these users include easy modem configuration, fast file transfers, wizards for scheduling unattended synchronization routines, and printer redirection.

CUSTOMER SERVICE

Many PC vendors such as Compaq and IBM bundle remote-control software with their products. If a customer encounters a problem, a support technician can take over the system and resolve the problem without having to ship the PC back and forth. Key features for these users include voice chat over data.

IN THIS REVIEW

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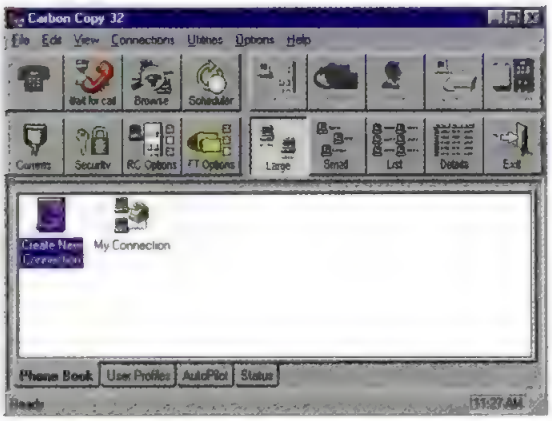
series of tests under both Windows 95–to–Windows 95 and Windows NT–to–Windows NT. Our tests covered three different types of connections: modem-to-modem, dial-up networking, and network. The better programs performed consistently well on both platforms and under all connection types.

For many corporations seeking to implement remote-control solutions, security is a major concern—especially when using Internet connections. Standard security features include the ability to "blank" the host screen and to disable the keyboard and mouse, as well as to force the host to reboot if disconnected during a session in order to prevent someone from using the system without having to log on. Most of these programs also support user names and passwords, data encryption, and integration with Windows NT security.



Carbon Copy's Create New Connection wizard works just like the one in Windows.

With all the different chores these products are called on to perform, we did not expect to find one or more programs that would meet the needs of each and every remote-control user. But, as you'll see, we did find several that deliver a good mix of remote-control and file-transfer features, performance, and security.

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Visit our Web site for a more detailed breakdown of our remote-control and file-transfer performance tests—plus an interactive comparison of product features.

Compaq Carbon Copy 32 5.0

$150 street. Compaq Computer Corp., Houston; 800-345-1518, 281-370-0670; www.compaq.com.

● One of the first remote-control products, Carbon Copy—along with the rest of Microcom—was acquired a year ago by Compaq Computer Corp., which has continued to develop it as both a standalone product and as part of the software bundled with its PCs. The latest version, Compaq Carbon Copy 32 5.0, includes powerful wizards for automating tasks, remote printing, voice-over-data communication, and enhanced security. A well-rounded offering, it meets the needs of most users but ultimately falls short of Traveling Software's LapLink for Windows NT/95 7.5 and Symantec's pcAnywhere32 8.0.

In addition to Windows 95 and Windows NT, Carbon Copy supports Windows 3.*x* and Windows CE. It includes a parallel cable and a microphone and supports modem, network (IPX/SPX and TCP/IP), Internet, parallel and serial, infrared, and ISDN connections. Compaq also offers a commercial edition ($130 street) that excludes the Windows CE client and hardware peripherals.

Of the products in this roundup, Carbon Copy delivered one of the best out-of-box experiences. The program walked us through the setup and configuration. Carbon Copy's Create New Connection wizard looks and acts like the one in Windows. System administrators will appreciate the Create New User wizard.

A new AutoPilot wizard lets you automate file transfer and synchronization tasks. AutoPilot routines can be run manually or scheduled on a regular basis using Carbon Copy's built-in scheduler or Windows' System Agent.

Carbon Copy now supports voice-over-data communication so that users can chat during remote-control and file-transfer operations. Unlike that of many programs, Carbon Copy's chat feature doesn't require an ASVD/DSVD (analog or digital simultaneous voice and data) modem. The Dynamic Internet Dial and Browsing feature lets users registered with an Internet Locator Service (ILS) dial in to a PC via an Internet connection and to locate host PCs by name.

One of the highlights of Carbon Copy is its file-transfer and synchronization feature. The program provides an Explorer-like interface, drag-and-drop support, and delta file transfers. On our file-transfer tests, Carbon Copy's scores were average.

Carbon Copy boasts a full complement of remote-control features, including remote printing. But the program did not fare as well on our remote-control tests. Under Windows 95, Carbon Copy's scores were in the bottom half of the group. It fared better under Windows NT, turning in the fastest time over a network.

The security features are robust and can be set at several different levels. On Windows NT hosts, the user manager lets you grant file, chat, and remote-access rights to groups and individuals. For secure data transmission, Carbon Copy supports encryption with key lengths up to 64 bits.

Although a couple of programs reviewed here retain a slight edge, Carbon Copy has a long list of features and powerful wizards that put it near the top of this category.—*Padraic Boyle*

CoSession Remote 32 8.1

$120 street. Artisoft Inc., Tucson, AZ; 800-846-9726, 520-670-7100; www.artisoft.com; 502 at www.pcmag.com/infolink.

● With a powerful suite of remote-control features, Artisoft's CoSession Remote 32 8.1 should appeal to a broad range of users. But it has some shortcomings, such as problems with dial-up networking, an inability to redirect printers, and the lack of a scripting utility to automate tasks. These glitches make CoSession better suited as a help desk application than as a dial-in remote-control client.

CoSession includes the guest and host software for both Windows 95 and Windows NT on a single CD. It can operate over dial-up, modem-to-modem, Internet, IPX and TCP/IP, or NetBIOS-based network connections. Unfortunately, we encountered major problems with dial-up networking on our multiple test systems. Apparently, this was caused by conflicts

Our Contributors: STEVE RIGNEY and PADRAIC BOYLE are contributing editors of *PC Magazine*. DOUGLAS GILES is a freelance writer. DIANE JECKER was the project leader, and JOHN MORRIS was the associate editor in charge of this story.

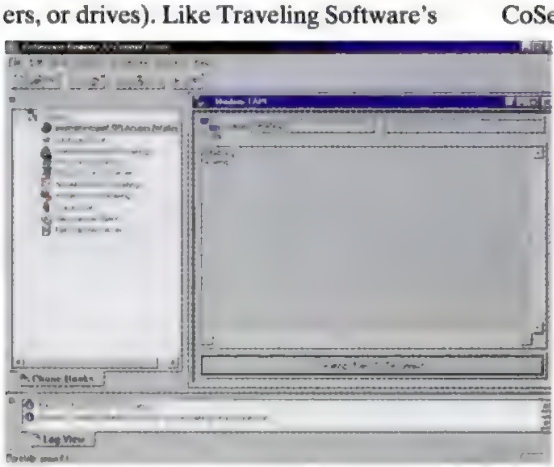
between our network cards and CoSession's dial-up networking. Artisoft was not able to duplicate this problem or offer a solution.

Aside from these conflicts, CoSession's installation was easy. The wizards, which can guide you through either a custom or express setup, were particularly helpful, and the auto-sensing feature determined communication ports and modems.

When you launch CoSession, the Control Panel screen shows you all of your connection methods and utilities. Though this interface may be confusing to a novice user, we feel that it is a good environment for experienced users such as network administrators. CoSession's Control Panel automatically searches the network or dial-up connection for an available host, but unlike most of the other programs we reviewed, it doesn't provide you with the name of the host that you are controlling—except in some cases under NetBIOS.

CoSession offers the standard remote-control tools (color scaling, screen scaling, and the ability to disable wallpaper and screen savers). The role-reversal feature lets the guest and the host switch roles without having to end their session and reconnect. But CoSession's performance on remote-control tasks was poor. Under Windows 95, it had the slowest times on all three connection types. Performance under NT was slightly better.

The file-transfer features are fairly complete, offering file transfer (one-way copy), synchronization (bidirectional), and cloning (overwrites the selected files, folders, or drives). Like Traveling Software's LapLink and Symantec's pcAnywhere, CoSession can clone individual folders or entire drives. As with most entries here, it can also perform delta file transfers. On our tests, the program performed one of the fastest delta file transfers in this roundup. Otherwise, its file-transfer speeds were below average.



CoSession Remote displays all your connection methods in a single window.

CoSession supports user names, passwords, groups, and encryption for both data and log-on information. In testing, we were able to determine what components a user could access, then assign read/write privileges on the host PC. To further protect the server, you can run the host component as a Windows NT service.

This program offers some useful tools that can benefit a help desk. But the telecommuter looking for a dependable dial-up connection and a robust feature set will find better options here.—*Steve Rigney*

Editors' Choice

- pcAnywhere32 8.0

PC MAGAZINE EDITORS' CHOICE

Symantec's pcAnywhere32 8.0 makes all of the right connections. It offers an array of remote-control and file-transfer features, provides more robust security, and integrates with Windows NT. It also notched excellent scores across the board on our performance tests. Together, these traits make pcAnywhere the clear choice for remote control.

No matter what platform you use, you'll find a compatible pcAnywhere client. The version we tested supports Windows 95, Windows NT, Windows 3.*x*, and DOS. Symantec also offers Windows CE and browser-based clients. It supports all the expected connection types as well as some extras.

New remote-control features include integration with videoconferencing applications and the ability to match the host video resolution with the guest. In the file-transfer category, pcAnywhere offers delta file transfer. In addition to its powerful scripting language, it has an AutoXfer wizard for building tasks that can be invoked manually or put on a schedule.

One of the biggest areas of improvement in this version is its security. pcAnywhere now supports the Microsoft Crypto API. In addition, the program adopts Windows NT's users and security settings and can save remote-control sessions in Windows NT's event log. You can also control user access to drives and limit session time.

Whether you're planning to squeeze a few extra hours out of each workday by dialing in from home or need a company-wide remote-control solution, pcAnywhere is the answer.

LapLink for Windows NT/95 7.5

$150 street. Traveling Software Inc., Bothell, WA; 800-343-8080, 425-483-8088; www.travsoft.com; 503 at www.pcmag.com/infolink.

● Traveling Software's LapLink has long had a reputation as one of the best file-transfer programs. New features such as wizard-driven synchronization agents and an adaptive compression scheme further solidify its status. And LapLink is still one of the top performers in this category. But as a remote-control client, LapLink for Windows NT/95 7.5 is missing some key features, including drive mapping and printer redirection.

LapLink is available in several configurations. LapLink for Windows NT/95 7.5 includes a serial cable. LapLink for Windows 95 7.5 lacks NT support but includes a version for Windows 3.1 and a parallel cable. Each costs $150 (street). Traveling Software also offers Remote DeskLink ($50 street), a more limited package for telecommuters, as well as LapLink Tech

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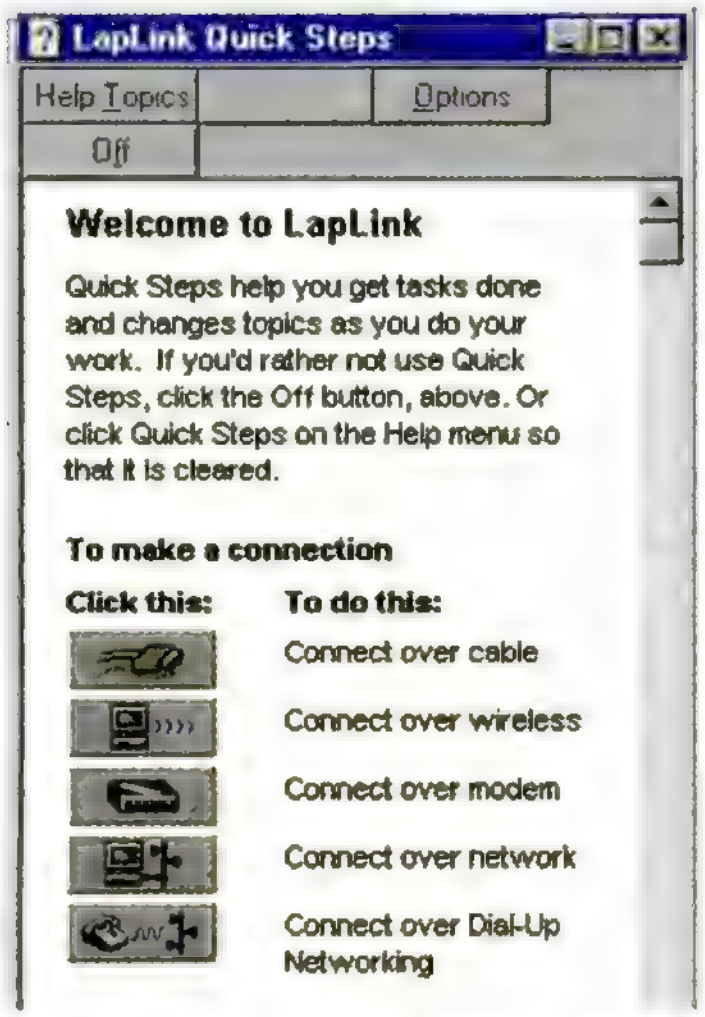


LapLink's Quick Steps can walk you through all common remote-control tasks.

($200 street), a product for PC support professionals.

LapLink supports network (TCP/IP and IPX), dial-up networking, Internet, direct cable, modem-to-modem, and infrared connections. We found the program easy to install. The pop-up Quick Steps provide context-sensitive dialog boxes that contain online help for current tasks. The only drawback to Quick Steps is that it obscures the main window, but as you become more familiar with the program, you can easily disable it.

LapLink has many tools to simplify file transfer. The new Xchange Agent, which is similar to AutoPilot in Compaq's Carbon Copy and AutoXfer in Symantec's pcAnywhere, lets you create regular file synchronization routines without delving into a complex scripting language. A useful feature of the synchronization tool is its ability to preview your settings to ensure that you don't overwrite important files.

LapLink's SpeedSync technology for delta file transfers compares files at the block level. This version of LapLink also features adaptive compression technology, which determines which files to compress based on the bandwidth of your current connection. Together, these features make LapLink one of the best choices for file transfers—a fact borne out by our file-transfer performance tests.

Traveling Software has added some features to bolster LapLink's remote-control functions. You can now filter out large bitmaps, and LapLink supports caching to improve performance during remote-control sessions. Nevertheless, it is still missing printer redirection and voice chat (both of which are included in LapLink Tech). Although LapLink did not dominate our remote-control tests as it did our file-transfer tests, it posted very respectable scores in this area as well.

The Windows 95 version lacks security options found elsewhere. Although it does offer passwords and encryption, you can't limit access to files or disk drives by user. But you can limit users to specific tools, including remote control, file transfer, and chat. Because the Windows NT version inherits Windows NT's user profiles and access rights, it offers a more secure solution.

Among remote-control programs, LapLink offers the fastest and easiest way to transfer a file from point A to point B. Although pcAnywhere generally has a slight edge, LapLink is a fine solution for personal remote control.—*SR*

NetOp for Windows 5.4

$150 street. CrossTec Corp., Boca Raton, FL; 800-675-0729, 561-391-6560; www.4ctc.com; 504 at www.pcmag.com/infolink.

● NetOp for Windows 5.4, from CrossTec Corp., is a remote-control application designed for one purpose: the corporate help desk. It lacks many features found in programs designed for telecommuters and day extenders, such as robust file-

SUITABILITY TO TASK

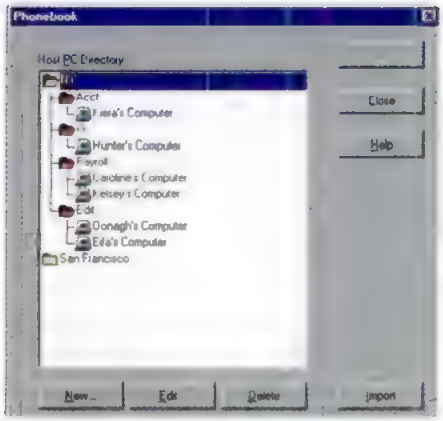
	Compaq Carbon Copy 32 5.0	CoSession Remote 32 8.1	LapLink for Windows NT/95 7.5	NetOp for Windows 5.4	pcAnywhere32 8.0	Procomm RapidRemote 1.51	ReachOut Enterprise 8.0	Remotely Possible 4.0
Setup and configuration	Excellent	Fair	Excellent	Fair	Excellent	Good	Good	Fair
Remote control	Good	Fair	Good	Good	Excellent	Good	Good	Fair
File transfer	Good	Good	Excellent	Poor	Good	Good	Fair	Fair
Security	Excellent	Good	Fair	Fair	Excellent	Good	Good	Good

The **setup and configuration** of remote-control software can be complex, because the application must be installed on two systems and configured to work with existing communications hardware and software. In addition to the actual installation, factors we consider are the program's ability to recognize modems, its integration with Windows' Dial-Up Networking, and the procedure for creating new host and guest connections. Most of the products we looked at include wizards that facilitate configuration.

The fundamental role of remote-control software is to take over a system remotely and make it appear as though the user were at the host's keyboard. To gauge a program's proficiency at **remote control**, we rate its ability to negotiate differing screen resolutions and faithfully replicate screen elements. To boost performance, many products can also disable the host wallpaper and screen saver. Other features in this category include drive mapping, printer redirection, and the ability to use voice chat in conjunction with remote control.

Remote-control software lets a user keep files and folders on two or more PCs in sync. Although **file transfer** sounds simple, vendors have found many ways to enhance the process. The better programs use a standard, Windows Explorer–like interface and support drag-and-drop and long filenames. In addition to copying a file from one location to another, remote-control programs can synchronize files or folders between two PCs (bidirectional) and clone entire folders or drives. To improve performance of file transfers, most programs support delta transfers, which copy only the changed portions of a file. Most products also provide wizards, scripting engines, or both for automating file transfers. Finally, we test each program's ability to resume a file transfer after a disconnection.

As more remote users rely on the Internet, **security** becomes critical. Standard features include the ability to make the host screen blank and disable the keyboard and mouse during a remote-control session. These products should also provide passwords and access rights based on user profiles. Some programs integrate with Windows NT's user profiles and access rights. Additional security features include the ability to force a reboot of the host after being disconnected, set time limits on sessions, encrypt data that is being transferred, and log remote-control sessions. A couple of programs here also have antivirus software.



Large organizations will appreciate NetOp's Phonebook, which organizes host PC connections into groups.

transfer capabilities and remote printing. CrossTec promises that its next version, due out at about the time you read this, will address these shortcomings. In the meantime, NetOp offers some attractive features for help desk environments.

Unlike most products reviewed here, which bundle the guest and host software for multiple platforms on a single CD, NetOp takes a modular approach, with separate modules for the guest, host, access server, and gateway. This design lets the network administrator install only the features that each client needs. A guest/host combination package costs $150 street. The access server and gateway, which we did not test, cost $900 and $500, respectively. NetOp supports Windows 95/NT/3.1, DOS, and OS/2 Warp. Each of the platforms must be purchased separately.

Installing and configuring NetOp is easy. Like its competitors, the program uses wizards to walk you through the whole process. As with Quarterdeck's Procomm RapidRemote, NetOp's guest and host software consist of two separate components. Unlike RapidRemote, however, NetOp doesn't offer the option of installing both components at once; each must be installed individually.

The interfaces for both guest and host are intuitive and include toolbar buttons for accessing the most frequently used utilities, such as remote control, address book, chat, and file transfer. We especially liked NetOp's hierarchical, graphical Phonebook feature: Hosts are placed in file folders to distinguish them more easily from one another. Hosts in payroll, for example, can be placed in a separate folder from the hosts in accounting. The NetOp host supports up to ten simultaneous guest connections. On our remote-control performance tests, the unit notched the fastest time by far over a network under Windows 95. This alone makes NetOp worth a look if you are seeking a help desk solution. Its scores on the other tests were average.

NetOp's file-transfer capabilities are rudimentary. Instead of an Explorer-like interface, it provides a dialog box that lets you browse through directories and select To and From locations. NetOp lacks drag-and-drop support and offers no tools for automating file synchronization tasks. It also lacks true delta file synchronization. Instead, it scans files, and when it detects any change, it copies the rest of the file from that point. On our tests, this method showed little or no performance advantage.

By default, NetOp's security offers full access to all users, which means it is up to you to close the door and let in only authorized users. When configured properly, the model provides a very granular breakdown of guest access privileges. It can enforce passwords, limit access by Mac or IP address, and restrict access to utilities such as chat.

Large organizations looking for a flexible help desk solution that supports OS/2 should consider NetOp, but most users will be better off with another program.—*PB*

pcAnywhere32 8.0

$150 street. Symantec Corp., Cupertino, CA; 800-441-7234, 541-334-6054; www.symantec.com; 505 at www.pcmag.com/infolink.

PC MAGAZINE EDITORS' CHOICE

Symantec Corp.'s pcAnywhere commands a significant share of the remote-control market. After testing the latest version, pcAnywhere32 8.0, it's easy to see why. The program supports a vast array of platforms; offers comprehensive remote-control, file-transfer, and security features; and consistently delivers above-average performance. Version 8.0 adds better Windows NT support and the ability to connect multiple guests to a single host, making pcAnywhere the program of choice.

Out of the box, pcAnywhere supports Windows 95, Windows NT, Windows 3.*x*, and DOS. Registered users can download free browser-based remote-control

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There's more to the ThinkPad's appeal than hot specs and a big screen. Like flexible architecture. IBM's UltraBay is the industry's most comprehensive modular design. It allows you to hot-swap components to suit one purpose one minute, and change your mind (and your configuration) the next… or to travel light. UltraBay means versatility!

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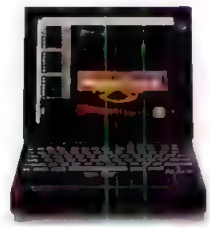

ThinkPad 380ED

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- 13.3" TFT XGA Color Display
- 1024 x 768 Resolution
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clients (available as an ActiveX control, Java applet, or Netscape Navigator plug-in), and Symantec also offers a client for Windows CE. The Windows client we tested supports network (Banyan's VINES, IPX/SPX, NetBIOS/NetBEUI, and TCP/IP), dial-up networking, wireless, direct cable, infrared, modem-to-modem, and ISDN connections.

The basic remote-control features are all present in pcAnywhere, but Symantec adds some extras. For instance, during remote-control sessions, you can switch from data to voice or even videoconferencing via integration with White Pine Software's Enhanced CU-SeeMe 3.0 ($69 direct). This version also has the ability to synchronize the video resolution of the host to the guest, and it maps left-hand/right-hand mouse clicks between PCs.

To boost performance, pcAnywhere queues the host screen and caches it as a single bitmapped image before sending it to the remote—producing some of the fastest refresh rates we tested. But this approach has some drawbacks. For example, the guest PC may miss a dialog box if it appears only briefly on the host PC's screen. And pcAnywhere can be slow on tasks such as typing and scrolling. Yet pcAnywhere posted some of the best scores, including the fastest times when using dial-up networking under Windows 95 and Windows NT.

The file-transfer tool is straightforward. You can drag and drop files between the guest and host PCs. To increase transfer speeds, pcAnywhere uses compression and supports delta file transfer. A wizard-driven AutoXfer agent lets you automate file synchronization chores, and pcAnywhere includes a powerful scripting language. On our tests, pcAnywhere notched above-average file-transfer scores across the board, especially on our highly compressible 200K file.

Some of the key improvements in this version concern security. In addition to user names, groups, and passwords, pcAnywhere supports the Microsoft Crypto API, which lets you use public/private key or symmetrical encryption (40- or 128-bit key lengths) to protect your data in transit. We also liked its ability to authenticate users with the Windows NT user manager and domains. pcAnywhere stores any intrusion alerts in its own log file or the NT Event Log. Other security features let you control drive access, limit a user's connection time, and automatically reboot the host on disconnect. Finally, pcAnywhere includes Norton AntiVirus.

Wizards in pcAnywhere make it easy to create and configure connections.

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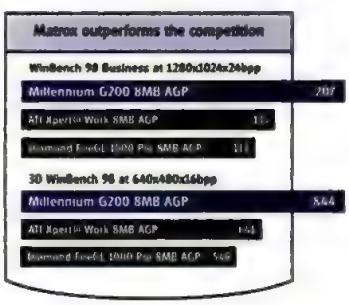

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pcAnywhere is truly the best way to access a PC from anywhere.—*SR*

Procomm RapidRemote 1.51

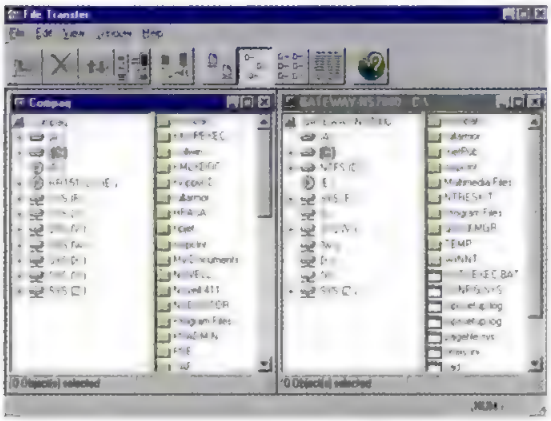
$70 street. Quarterdeck Corp., Marina del Rey, CA; 800-354-3222, 573-443-3282; www.quarterdeck.com; 506 at www.pcmag.com/infolink.

● For a relatively low price ($70 street), Quarterdeck Corp.'s Procomm RapidRemote 1.51 provides a lot of bells and whistles. With features such as data encryption, printer redirection, and the Connection Manager, RapidRemote is a good alternative for both basic dial-in remote-control and help desk users.

The unit is compatible with Windows 95, Windows NT, and Windows 3.*x*. It can connect via dial-up modem, TCP/IP and SPX networks, or directly via a serial cable.

We found RapidRemote one of the easiest products to install and use. Even novice users should be able to complete installation in minutes. Like CrossTec's NetOp for Windows 5.4, RapidRemote divides guest and host software into two distinct components. During installation, you may choose whether you want to install both or just one of them.

SmartWizards is a useful feature that helps you set up your users, hosts, clients, and hardware. One wizard even detected the IP address of our host PC.



The file-transfer window in RapidRemote looks and acts like that in Windows Explorer.

The interface is fairly basic and includes icons for performing tasks such as editing an entry and disconnecting. The Host program lets you pick the type of connection to answer and provides information on current callers. Call Manager, the remote utility, lets you create new entries for connecting with hosts.

When connecting over the Internet, you must first establish a connection on both sides and then use the standard TCP/IP option to find the host. Other products, such as Symantec's pcAnywhere, will actually help you establish your Internet connection and search for a host.

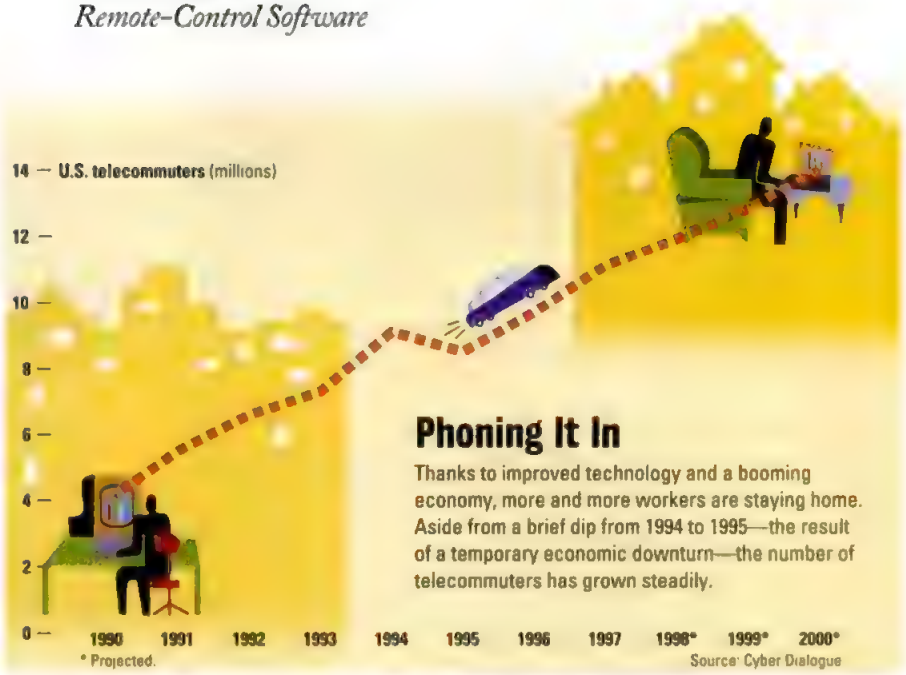
We found the remote-control feature extremely easy to initiate and use. You can view the host screen in a window or scale to full screen. To improve performance, you can turn off the desktop background and high-resolution colors. RapidRemote also lets you simultaneously connect to multiple host PCs.

On our tests, RapidRemote garnered only average scores for dial-up remote control. It did produce, however, the fastest remote-control capabilities for modem-to-modem connections under Windows 95.

RapidRemote's Explorer-type file-transfer utility makes the process easy. To improve performance, the unit offers data compression and delta file synchronization. It posted the fastest time on our delta file transfer test under Windows 95 dial-up networking; other Windows 95 scores were average. Under Windows NT, it excelled over modem-to-modem connections.

The program's security features include user names, passwords, encryption, intruder detection, and callback. The built-in audit trail lets you see who's logged on, any failed attempts, and the names of the files a user transferred. You can place limits on the length of sessions, and the Hacker Protection feature can lock down the system for a preset time.

About the only thing missing from RapidRemote is a wizard or scripting utility to automate tasks. Otherwise, it is a thorough program that performs well across the board.—*SR*



Phoning It In

Thanks to improved technology and a booming economy, more and more workers are staying home. Aside from a brief dip from 1994 to 1995—the result of a temporary economic downturn—the number of telecommuters has grown steadily.

ReachOut Enterprise 8.0

$150 street. Stac Inc., San Diego; 800-522-7822, 619-794-4500; www.stac.com; 507 at www.pcmag.com/infolink.

● With the release of ReachOut Enterprise 8.0, Stac has shifted the focus of its veteran remote-access client. By adding new tools, such as centralized management and tighter security, Stac has targeted the program at enterprise and help desk environments. But ReachOut Enterprise lacks some standard features, and we found problems with its file-transfer utility.

ReachOut Enterprise is available in

PERFORMANCE TESTS

Remote-Control Software

PC MAGAZINE LABS

The market leaders in the remote-control category, Symantec Corp.'s pcAnywhere32 8.0 and Traveling Software's LapLink for Windows 95/NT 7.5, are also the performance leaders on our tests.

Both products performed well, but pcAnywhere excelled on our remote-control tests, and LapLink retained its edge on our file-transfer tests. The margins between top performers—which also includes Compaq Carbon Copy 32 5.0 and Quarterdeck Corp.'s Procomm RapidRemote 1.51—were small, and we feel that most users will be satisfied with these packages. But although performance is critical, remote-control and file-transfer features, security, and ease of use are equally important.

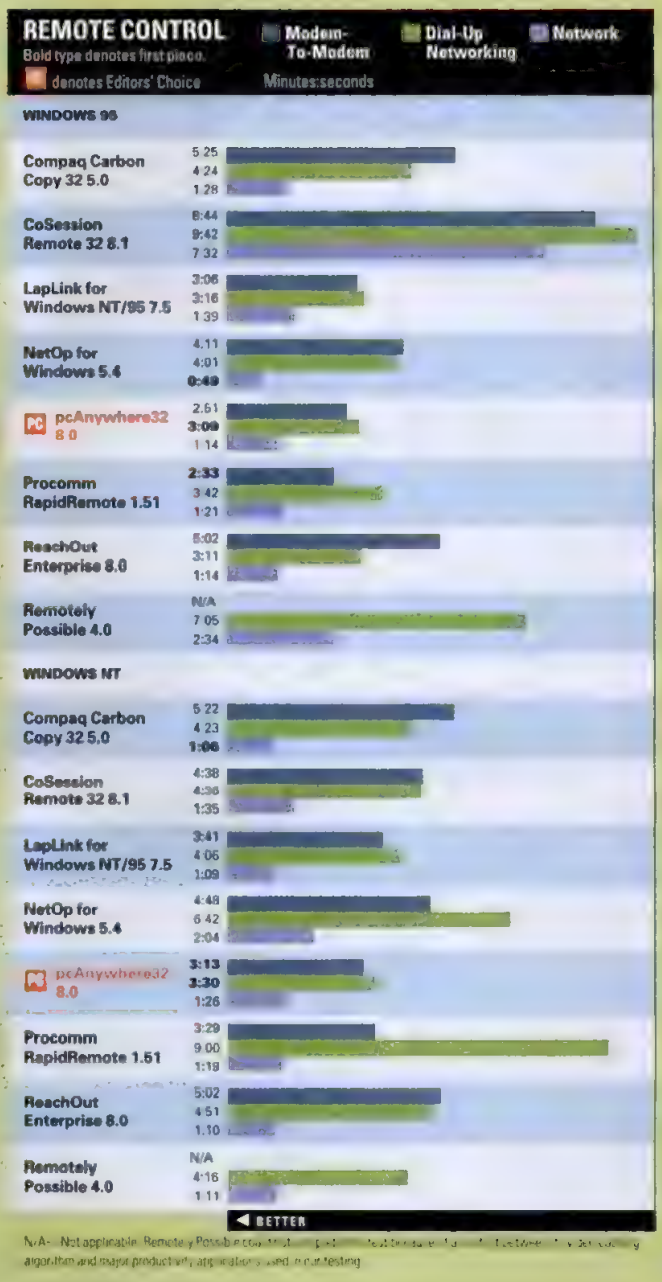
To gauge performance, we tested eight programs in two key areas: remote control and file transfer. Our remote-control tests measure a program's ability to redraw screens quickly when performing everyday tasks. Our file-transfer tests gauge performance on a variety of transfers including a delta file transfer, which copies only changed portions of files. The tests were performed under both Windows 95 and Windows NT over three connection types—modem-to-modem, dial-up networking, and network—but for file transfers, only the first two types are reported here.

Remote Control

The top performers on our remote-control tests were LapLink, pcAnywhere, and RapidRemote. When you look at the individual tasks that make up the test files, however, some interesting trends emerge. For example, pcAnywhere is the speediest when it comes to launching a graphics-intensive application, such as Netscape Communicator, and drawing screens with graphics. This is because of that program's screen-caching method. Rather than dividing a screen into elements such as toolbars, text areas, and graphics, pcAnywhere transfers each screen as a single, bitmapped image. On our screen-caching tasks, it was eight times as fast as its competitors on all connection types tested under Windows 95. By contrast, programs that do not support screen caching, such as Artisoft's CoSession Remote 32 8.1, did poorly here. Note that CoSession's performance on the network under Windows 95 was unusually slow relative to its speed under Windows NT. Artisoft claims that performance can be affected by other network protocols installed on the system, but even with only TCP/IP installed, we obtained similar subpar results.

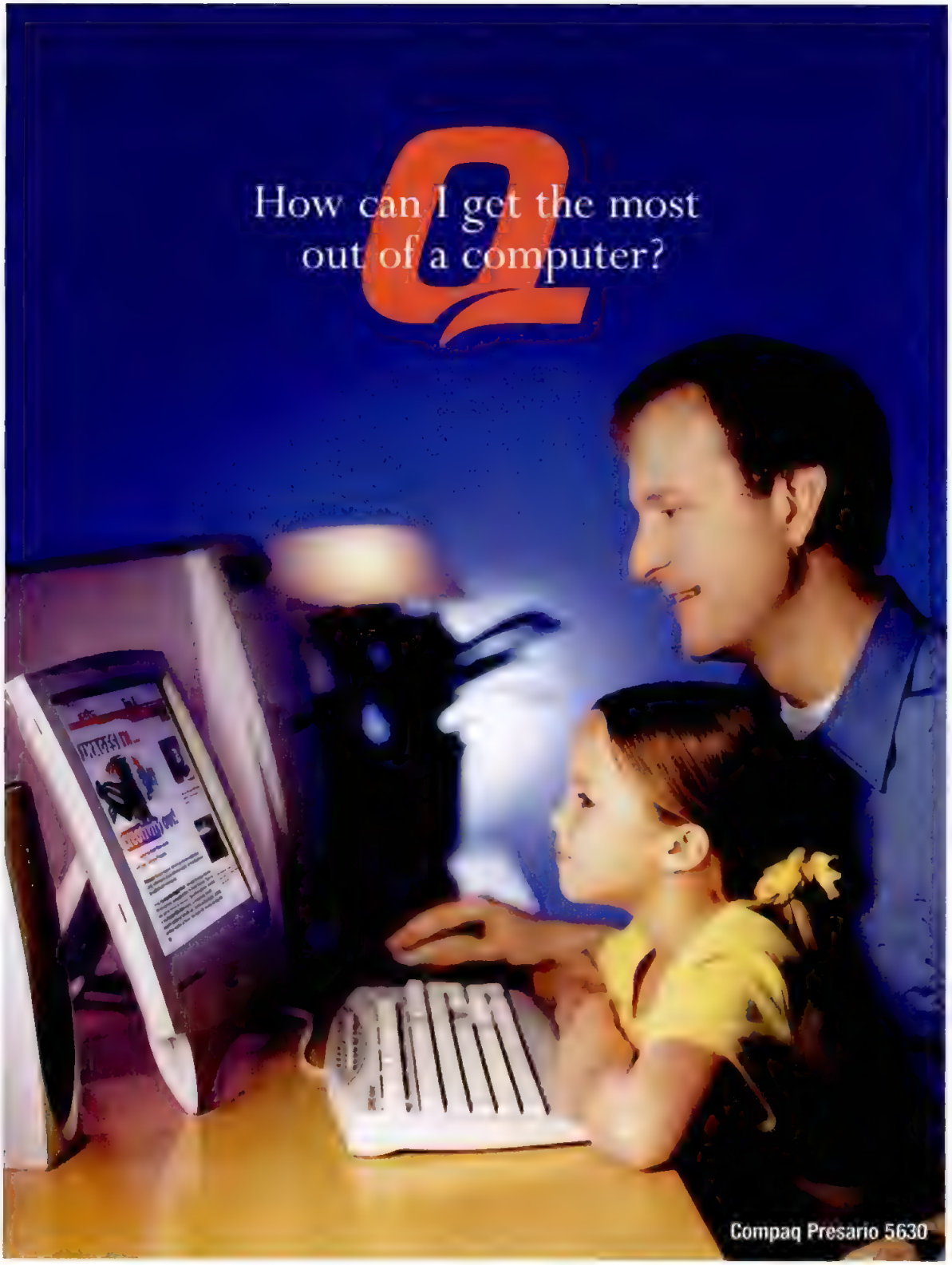
Screen caching has its drawbacks, however. When making minor changes to a document, programs using screen caching will attempt to redraw the screen each time a change is made. This can have a big impact on performance time. For instance, on our typing task, pcAnywhere took 8.5 seconds longer than CrossTec's NetOp for Windows 5.4 when using a modem-to-modem connection under Windows 95.

continues



N/A—Not applicable. Remotely Possible could not be tested under Windows 95 because of a conflict between its screen-caching algorithm and major product(s) or application(s) used in our testing.

▲ **Remote Control** Traveling Software's LapLink for Windows NT/95 7.5 and Symantec's pcAnywhere32 8.0 set the pace for remote-control performance. Of the six tests we performed (modem-to-modem, dial-up networking, and network under both Windows 95 and Windows NT), pcAnywhere posted scores among the three fastest in five cases, and LapLink ranked in the top three in four instances. pcAnywhere was especially strong on dial-up networking tests. Stac's ReachOut Enterprise 8.0 also performed well under Windows 95, as did Carbon Copy 32 5.0 under Windows NT.



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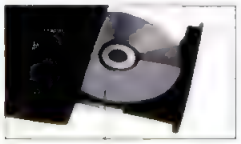

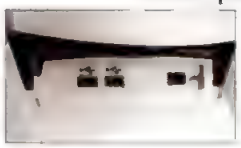

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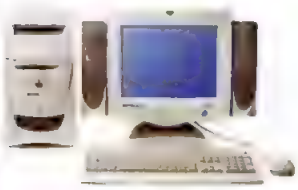

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- Smart Lilon battery
- 512 KB L2 Pipeline Burst Cache
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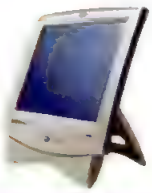

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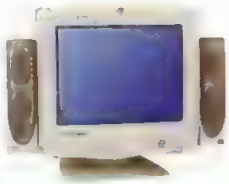

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PERFORMANCE TESTS

continued

File Transfer

LapLink, the veteran of the file-transfer industry, is still the one to beat here, performing consistently well on all versions of our file-transfer tests. Near the top were pcAnywhere and Carbon Copy. Stac's ReachOut Enterprise 8.0, the pacesetter from our last comprehensive roundup of remote-control software ("Friendly Takeovers," August 1996), fell to the middle of the pack.

In general, we found that file-transfer performance decreased when we switched from modem-to-modem to dial-up networking. Under Windows 95, the average difference when switching from modem-to-modem to dial-up networking ranged from about 1 second to 10 seconds, depending on the test. Under Windows NT, the difference was more apparent, ranging from more than 4 seconds to 16 seconds.

To determine how effective each program is at compressing, we performed tests using both highly compressible and non-compressible files. Each program has its own approach to file compression. Carbon Copy bases its compression on the file type. LapLink, on the other hand, bases its compression on available bandwidth regardless of the file type. pcAnywhere uses streaming compression in which all data is compressed, whether you are transferring a file or performing remote control.

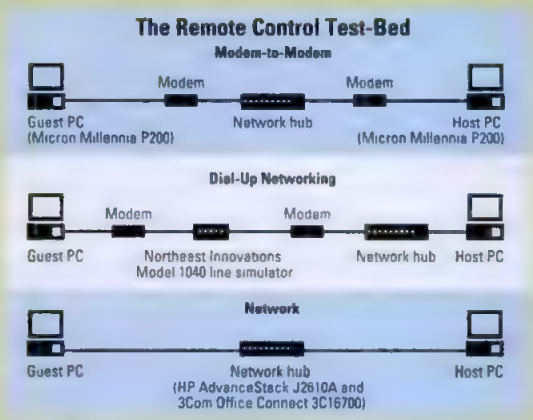
Since LapLink first introduced delta file transfers, nearly all products in this category have followed suit, with the exception of NetOp and Remotely Possible 4.0. NetOp offers what CrossTec calls a modified delta. It performs a linear byte count until it detects a change and then transfers the remainder of the file from that point. Our tests showed that NetOp's approach yields varying results, depending on where the changes in the file are located. Stac claims that ReachOut Enterprise 8.0 supports delta file transfers, but we discovered a bug in the program that prevented the feature from working properly. Stac has acknowledged this glitch. Of the products that can perform true delta file transfers, Carbon Copy, RapidRemote, and CoSession were the top performers, with LapLink and pcAnywhere close behind.

How We Tested

The remote-control tests comprise a series of 20 steps, which include launching Netscape Communicator, navigating Web pages, opening Microsoft Word documents, and navigating within documents and between applications. We ran these tests using three connection types; each step was timed manually, and we report the sum of all the steps. The screen resolution of the guest and host PCs were set at 1,024-by-768 with a color depth of 256 bits.

Our file-transfer tests comprise four file types: a 200K highly compressible file (93 percent compressible), a 200K noncompressible file, an 845K database file (78 percent compressible), and a delta file transfer using a modified version of the database file.

Apart from configuring remote control to full-screen mode, we tested each product using its default settings. Our test systems (both guest and host) were Micron Millennia PCs with 200-MHz Pentium processors, 32MB RAM, and Diamond Multimedia Systems' Diamond Stealth 3D 2000 graphics cards. On Windows 95 tests, both the guest and host were running Windows 95. On the Windows NT tests, the guest and host were running Windows NT 4.0 Workstation. For the Modem-to-Modem and Dial-Up Networking tests, we used U.S. Robotics' Courier V.Everything (Version 34) modems running at 33.6 Kbps and a Northeast Innovations Model 1040 telephone-line simulator. Our Network and Dial-Up Networking tests were performed on a TCP/IP network.—*Analysis written by Diane Jecker*



FILE TRANSFER

Seconds
Bold type denotes first place
PC denotes Editors' Choice

	Modem-To-Modem				Dial-Up Networking			
	200K files		Delta File Transfer		200K files		Delta File Transfer	
	Highly Compressible	Noncompressible	Full file (845K)	Delta	Highly Compressible	Noncompressible	Full file (845K)	Delta
WINDOWS 95								
Compaq Carbon Copy 32 5.0	6.0	24.4	67.1	5.7	6.0	32.6	66.5	8.3
CoSession Remote 32 8.1	13.2	25.4	62.2	6.3	15.6	34.9	91.1	6.0
LapLink for Windows NT/95 7.5	6.2	22.0	50.2	6.5	7.1	23.4	51.5	7.1
NetOp for Windows 5.4	5.9	25.4	67.0	N/A	6.7	28.2	73.0	N/A
PC pcAnywhere32 8.0	5.8	23.6	58.0	9.1	6.1	25.4	62.9	9.6
Procomm RapidRemote 1.51	6.0	25.2	64.5	12.4	10.4	30.9	86.3	4.7
ReachOut Enterprise 8.0	6.2	36.5	59.6	146.7*	6.0	34.8	59.7	114.5*
Remotely Possible 4.0	11.2	28.7	68.4	N/A	9.0	29.7	81.3	N/A
WINDOWS NT								
Compaq Carbon Copy 32 5.0	5.8	24.3	67.4	5.4	6.7	24.1	70.1	6.7
CoSession Remote 32 8.1	13.0	25.5	64.7	5.8	33.0	44.3	108.8	6.8
LapLink for Windows NT/95 7.5	6.4	22.6	50.7	7.2	7.5	24.3	63.8	7.0
NetOp for Windows 5.4	6.7	23.0	66.9	N/A	20.5	32.3	78.4	N/A
PC pcAnywhere32 8.0	5.4	23.8	59.8	9.4	7.2	30.7	78.3	11.1
Procomm RapidRemote 1.51	6.2	23.3	58.6	4.9	21.8	33.5	80.9	5.8
ReachOut Enterprise 8.0	5.8	34.2	60.3	158.3*	10.0	33.6	66.3	158.3*
Remotely Possible 4.0	12.6	31.1	66.9	N/A	21.7	33.3	78.6	N/A

N/A—Not applicable. This product does not support delta file transfer.
* Although Stac claims that ReachOut Enterprise supports delta file transfers, during testing we discovered a bug in the program that prevents it from working properly.

◀ **File Transfer** Just as they did on our remote-control tests, Traveling Software's LapLink for Windows NT/95 7.5 and Symantec Corp.'s pcAnywhere32 8.0 stood out on our file-transfer tests. In particular, Laplink and pcAnywhere dominated the Windows 95 tests. Compaq Carbon Copy 32 5.0 and Quarterdeck's Procomm RapidRemote 1.51 posted strong scores on the delta file transfer test. Stac's ReachOut Enterprise 8.0 could not perform delta file transfers properly, and its performance suffered here. Computer Associates' Remotely Possible 4.0 does not support delta file transfers, and CrossTec's NetOp for Windows 5.4 performs a modified delta transfer only.

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Other Avenues for Remote Access

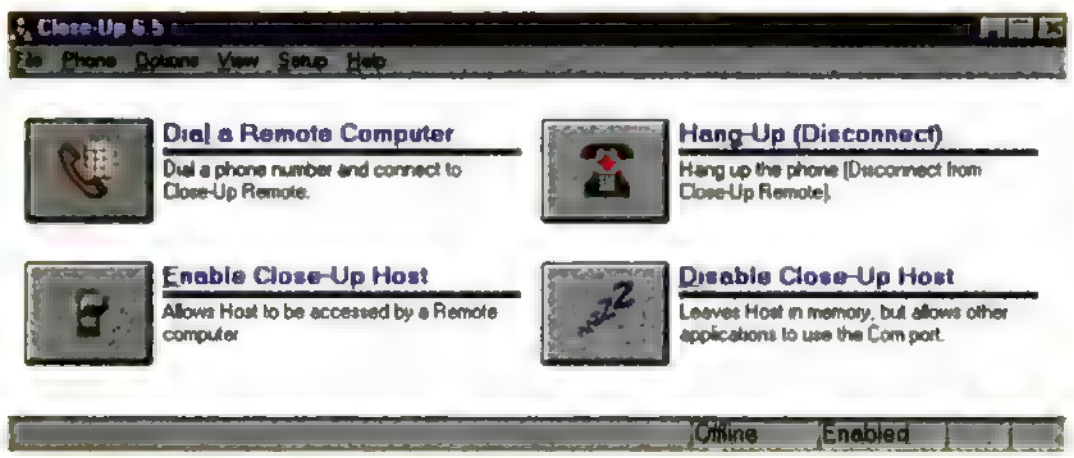
Remote access is a wide-open field, and during testing for our story, we came across a few remote-control solutions that didn't quite fit. Norton-Lambert Corp.'s Close-Up has not yet been upgraded to 32-bit. The other two programs, Funk Software's Proxy and Netopia's Timbuktu Pro, do not support modem-to-modem connections so far. But with the increased use of dial-up networking and Internet connections, modem-to-modem connections are becoming less critical, and these products offer special features that may appeal to some users.

Norton-Lambert distributes two versions of **Close-Up.** Close-Up 6.5 (host or guest, $80 to $90 street; Dual Pack, $120 to $150 street) offers modem-to modem connectivity, and Close-Up/LAN Pro 6.1 (2 users, $300 street; 20 users, $900 street), has network remote capability. The latter program is also bundled with an older version of Close-Up for modem-to-modem connections.

A DOS-based program, Close-Up/LAN Pro runs only on a Novell IPX network. Using it, you can view and control network workstations. Close-Up/LAN Pro is for help desk support, group conferencing, network dial-in, and file transfer.

Although Close-Up 6.5 ($29.95 direct, plus shipping and handling) runs under Windows 95 as well as DOS and Windows 3.*x*, it is not a 32-bit program and will not work with Windows NT. Furthermore, the host application supports screen resolutions only up to 800-by-600. Close-Up 6.5 does support remote printing under Windows 95, and it includes security features and a transaction log.

In short, Close-Up simply has failed to keep up with the competition. Other products reviewed in our main story, including Symantec Corp.'s pcAnywhere32 8.0, offer an up-to-date Windows interface and many more features at a lower price. (Norton-Lambert Corp., Santa Barbara, CA; 805-964-6767; *www.norton-lambert.com;* 521 at www.pcmag.com/infolink.)



Although it runs under Windows 95, Close-Up 6.5 needs an update to compete with the products in our main story.

Designed with the enterprise in mind, Funk Software's **Proxy 2.2** (master/host license, $195 list; 100 hosts, $1,995 list), is intended for help desks, network administration, and remote access to corporate networks.

Proxy runs on DOS, Windows 3.*x*, Windows 95, or Windows NT 4.0. It supports dial-up networking connections (using IPX or IP with a PPP remote-access server). Version 3.0, which should be available by the end of the summer, is expected to provide modem-to-modem connectivity as well as file transfers.

Proxy has three parts: Proxy Master, Proxy Host, and Proxy Server Host. Proxy Master resides on the guest PC and takes over a remote PC that is running Proxy Host. Proxy can also take over multiple PCs at once. Proxy Server Host is an NLM (NetWare Loadable Module) for a NetWare file server. Proxy Master can scan the network to locate all available host workstations. Alternatively, you can poll for Proxy Hosts by IP address, machine name, broadcast address, or scan groups. Proxy also supports DNS (Domain Naming System). This program's security features include screen blanking, password encryption, IP disabling, and time blocking.

With Version 3.0's added modem-to-modem connectivity, Proxy should become a worthy contender in the remote-control market. (Funk Software Inc., Cambridge, MA; 800-828-4146, 617-497-6339; *www.funk.com;* 522 at www.pcmag.com/infolink.)

A family of products for enterprise-level remote control and file exchange, **Timbuktu** is best known for its Macintosh version, but it also includes versions for Windows 95, Windows NT, and Windows 3.1. Timbuktu Pro 32 for Windows 95 and Windows NT is available in a Twin Pack ($140 street). A separate product, Timbuktu Pro Enterprise 2.0, is intended for networks of 100 users or more (starting at $6,000 street).

Timbuktu Pro works over Internet, IPX, LAN, RAS, TCP/IP, or WAN connections. Both Timbuktu Pro 32 and Timbuktu Enterprise use Netopia's V-wedge technology, which permits device-independent screen sharing between Windows NT machines and other PCs without changing video drivers or manipulating the operating system. Timbuktu Pro's security features include screen blanking, password encryption, user-level-defined privileges, password aging, event logging, and master-password protection.

With its ability to tie together Windows 95, Windows NT, Windows 3.*x*, and Mac systems efficiently, Timbuktu Pro is a powerful solution for companies with mixed environments. (Netopia Inc., Alameda, CA; 510-814-5100; *www.netopia.com;* 523 at www.pcmag.com/infolink.)

—Douglas Giles

a network-only or modem/network version. The latter, which we tested, supports modem-to-modem, LAN, Internet, and ISDN connections.

The program provides a series of wizards that ease installation and configuration. During the installation on Windows 95 clients, however, we had to update our Winsock to Version 2.0 in order to use IPX and TCP/IP protocols. Though this file is included on the CD, the Winsock upgrade is not part of the installation procedure (Version 8.0 will prompt the user to upgrade Winsock).

ReachOut relies on a single interface for both host and guest modes. Connection profiles can be made with the help of wizards. Tightly integrated with Windows 95's dial-up networking, ReachOut Enterprise makes remote connections a seamless task.

The centralized installation and management functions offer a great way to manage remote access in the enterprise, letting network administrators configure options and apply them to all installations.

The zero admin host service feature launches the host component on a system when it is turned on. The host component resides quietly in the background, so a help desk administrator can easily take

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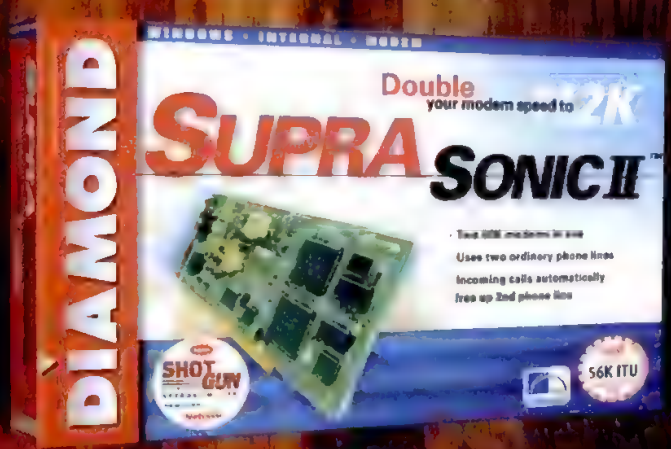

The rush is on! Because right now, Diamond's Shotgun-enabled modems are available at retailers all across the country. Diamond's exclusive Shotgun technology delivers a double barrel of bandwidth by combining the capacity of two separate phone lines. So you get connection speeds up to 112K. And Shotgun technology is available today, in Diamond's powerful new SHOTGUN TECHNOLOGY modems.

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SUMMARY OF FEATURES See www.pcmag.com for interactive views

Remote-Control Software

■ YES ▨ NO	Compaq Carbon Copy 32 5.0	CoSession Remote 32 8.1	LapLink for Windows NT/95 7.5	NetOp for Windows 5.4	pcAnywhere32 8.0 (PC MAGAZINE EDITORS' CHOICE)	Procomm RapidRemote 1.51	ReachOut Enterprise 8.0	Remotely Possible 4.0
Street price	$150	$95	$150	$150	$150	$70	$160	$120
Technical-support number	800-652-6672	800-846-9726	425-487-8810	800-675-0729	541-465-8430	800-354-3222	619-794-3700	516-761-7900
Technical-support hours (eastern time)	24 hours, 7 days	10:00–6:00 M–Th, 11:00–6:00 F	11:00–8:00 M–F	8:30–5:00 M–F	9:00–7:00 M–F	10:00–7:00 M–Th, 11:00–7:00 F	11:00–8:00 M–F	8:00–8:00 M–F
Supports TAPI (Telephony API)	■	■	■	▨	■	■	■	■
Setup								
Automatically configures modem	■	■	■	▨	■	■	■	■
Supports Plug and Play	■	■	■	▨	■	■	■	■
Remote installation	■	▨	▨	■	■	▨	▨	■
Connections								
Serial/parallel/ECP port	■ ■ ▨	■ ■ ■	■ ■ ■	■ ▨ ▨	■ ■ ■	■ ▨ ▨	■ ▨ ▨	■ ▨ ▨
Analog modem/ISDN adapter	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
LAN/Internet/RAS	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Wireless IrDA	■	■	■	■	■	▨	■	■
Integrates with Windows 95 Dial-Up Networking	■	▨	■	▨	■	■	■	■
DNS/IP/Dynamic IP addresses	■ ■ ■	▨ ■ ▨	■ ■ ■	■ ■ ■	▨ ▨ ■	■ ■ ■	■ ■ ■	■ ■ ■
Protocol Support								
IPX/MP/RAS	■ ▨ ■	■ ■ ■	■ ■ ■	■ ▨ ■	■ ■ ■	■ ▨ ■	■ ■ ■	■ ■ ■
NetBIOS/NetBEUI	▨ ▨	■ ■	▨ ▨	■ ■	■ ■	▨ ▨	■ ■	■ ■
SLIP/PPP	■ ■	▨ ■	■ ■	■ ■	▨ ■	■ ■	■ ■	■ ■
TCP/IP	■	■	■	■	■	■	■	■
Remote Control								
Multiprotocol wait-for-call	■	■	■	■	■	▨	■	■
Simultaneous host and guest	■	■	■	■	■	■	■	■
Multiple host/guest connections	■ ■	▨ ▨	■ ▨	■ ▨	■ ■	■ ▨	■ ■	■ ■
Color scaling/Redirected printing	■ ■	■ ▨	■ ▨	■ ▨	■ ■	■ ■	■ ■	■ ■
Chat (voice over data)	■	■	▨	■[1]	■[1]	▨	■[1]	■[1]
Session/permanent caching	■ ▨	■ ▨	■ ■	■ ■	■ ■	■ ▨	■ ■	■ ■
Can disable host PC wallpaper/screen saver	■ ■	■ ■	■ ■	■ ■	■ ▨	■ ■	■ ■	■ ■
Includes scripting	■	▨	▨	▨	■	▨	■	▨
Provides a single interface for host and viewer	■	■	■	▨	■	▨	■	■
Role reversal/Remote reboot	■ ■	■ ▨	■ ■	▨ ■	■ ■	▨ ■	▨ ■	■ ■
Screen resizing/matching	■ ■	■ ■	■ ■	■ ■	■ ■	■ ▨	■ ■	▨ ■
Host broadcasting	■	▨	▨	■	■	▨	■	■
Can search a subnet	■	■	■	■	■	▨	■	■
Windows NT guest controls Windows 3.x/95 hosts	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Windows 95 guest controls Windows 3.x/NT hosts	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Windows 3.x guest controls Windows 95/NT hosts	■ ■	▨ ▨	■ ■	■ ■	■ ■	■ ■	■ ■	■ ▨
File Transfer								
Restores transfers after interruption	■	■	■	▨	■	■	■	■
Delta file transfer/Unattended file synchronization	■ ■	■ ▨	■ ■	▨ ▨	■ ■	■ ▨	■[2] ■	▨ ▨
Synchronizes directories/drives	■ ■	■ ■	■ ■	▨ ▨	■ ■	■ ■	■ ■	▨ ▨
File compression/encryption	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Terminal emulation/Virus protection	■ ▨	▨ ▨	▨ ▨	▨ ▨	■ ■	▨ ▨	▨ ■	▨ ■
Security								
Password encryption	■	■	■	■	■	■	■	■
Separate administrative password	■	■	■	■	■	■	■	■
User can set expiration date on password	▨	▨	▨	■	▨	▨	■	■
Restrict access to drives/directories/files	■ ■ ▨	■ ■ ■	▨ ▨ ▨	▨ ▨ ▨	■ ■ ■	▨ ▨ ▨	■ ■ ■	▨ ▨ ▨
Blank screen/Disable keyboard/Disable mouse	■ ■ ■	▨ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Audit log/Automatic dial-back	■ ■	▨ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
User can set time limits on sessions	■	▨	▨	▨	■	■	■	▨
Roving dial-back/Host lockout/Intruder detection	■ ▨ ■	■ ▨ ▨	■ ■ ■	■ ▨ ▨	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ▨
Network log-on after attaching to host	■	■	■	■	▨	■	■	■
Can schedule when host is enabled and disabled	▨	▨	▨	▨	■	▨	▨	▨
Unattended host system is secure	■	▨	■	■	■	■	■	■

(1) Only with ASVD/DSVD modems. (2) A bug prevented ReachOut from properly performing this function.

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control of the system for troubleshooting.

ReachOut Passport lets users connect to a host over an intranet or the Internet without having the remote-control software installed locally. Instead, a guest can establish a connection via Microsoft Internet Explorer or Netscape Communicator.

A scripting tool automates tasks. This tool is not for novices, however. Unlike products that offer wizards to create tasks, ReachOut requires you to create batch files in a separate text editor.

ReachOut's file-transfer and synchronization utility is easy to use, but we discovered a bug that prevents the delta file transfer from working properly. Stac says it will have a patch to correct the problem by the time you read this. We also encountered a problem with synchronization: When a file and a directory had the same name, transfers didn't take place.

On our file-transfer tests, ReachOut had average to poor scores except for the highly compressible and 845K database file under Windows 95 dial-up networking. On our remote-control tests, its performance over network connections was notable.

ReachOut's security is fairly robust, letting you specify access control to host files and times at which a user can connect. It also includes Network Associates' McAfee VirusScan for protection when transferring files. Windows NT hosts have the option of using either Microsoft's local security model or ReachOut Enterprise's.

ReachOut offers several features for network administrators, including a detailed event log.

Stac has added some compelling features for corporate help desks and system administration to this version. But until Stac resolves the problems with its file-transfer features, we recommend you look elsewhere.—*PB*

Remotely Possible 4.0

$120 street. Computer Associates International Inc., Islandia, NY; 800-225-5224, 516-342-5224; www.cai.com; 508 at www.pcmag.com/infolink.

● The standalone version of Remotely Possible 4.0, which we reviewed, is also sold as part of Computer Associates' network management suite. The product has some nice features, such as the ability to record sessions. But it has a poor file-transfer tool, and on our tests we encountered problems. Unless you already use CA's Unicenter TNG network management suite, you should look elsewhere for a remote-control solution.

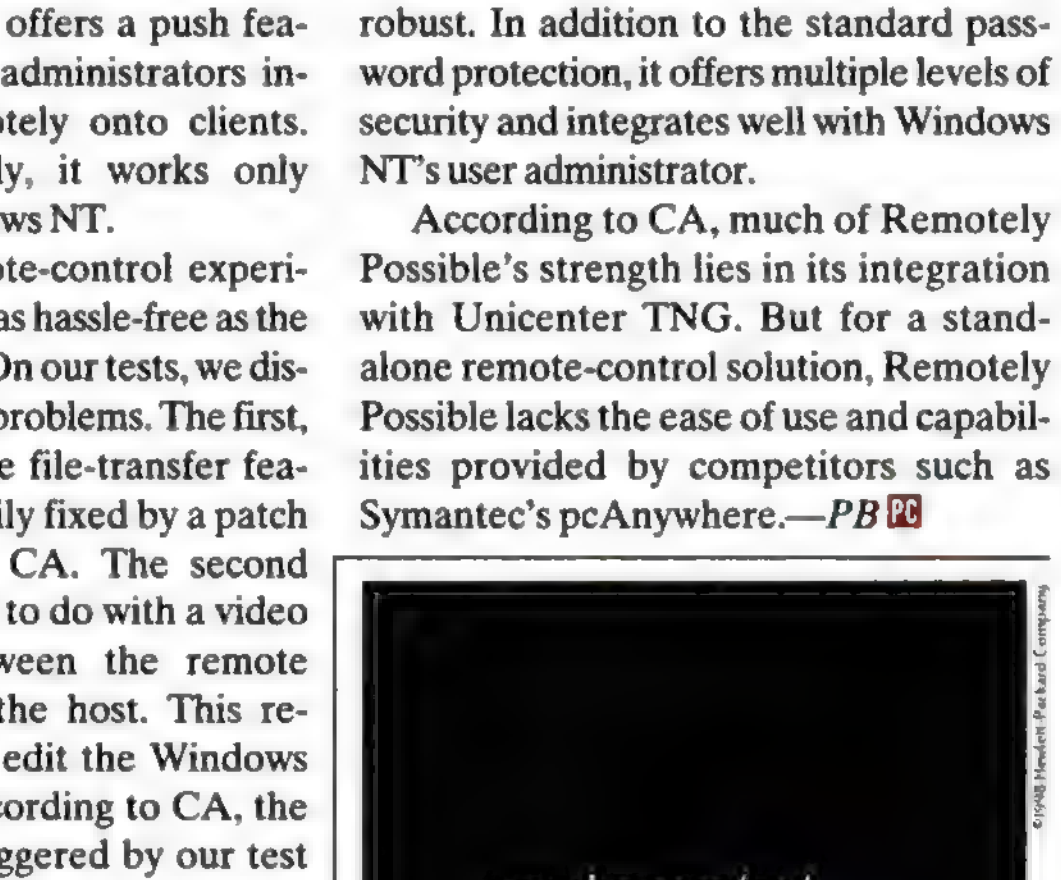
Remotely Possible supports Windows 95, Windows NT 3.51 or later, Windows 3.1, and DOS. Connection options include IPX, PPP, RAS, TCP/IP, and modem-to-modem. The program also provides the only remote-control solution for Alpha-based Windows NT servers.

Like many of the other remote-control packages, Remotely Possible uses wizards to ease installation. And like pcAnywhere, the program offers a push feature, letting administrators install it remotely onto clients. Unfortunately, it works only under Windows NT.

Our remote-control experience was not as hassle-free as the installation. On our tests, we discovered two problems. The first, related to the file-transfer feature, was easily fixed by a patch supplied by CA. The second problem had to do with a video conflict between the remote viewer and the host. This required us to edit the Windows registry manually. According to CA, the video problem was triggered by our test systems' video drivers, but no other product we tested had such problems.

We found the remote-control feature fairly easy to initiate but a bit confusing at first. By default, it opens in full-screen mode with no toolbar or any other sign of how to return to the local screen. After learning a few shortcuts, however, we were able to switch back. Remotely Possible can access multiple hosts at one time and offers a Stealth Mode that lets you view remote hosts without being detected.

The file-transfer utility has an awkward interface. On execution, an Explorer-like box pops up representing the host's drives. But to view the local drive's contents, you must open Windows Explorer manually. The file-transfer feature supports crash recovery and drag-and-drop but doesn't offer file synchronization. Furthermore, drag-and-drop didn't always function properly. On our tests, Remotely Possible had below-average file-transfer scores.



To transfer files with Remotely Possible, you must use Windows Explorer to view and access local files.

Remotely Possible's security is fairly robust. In addition to the standard password protection, it offers multiple levels of security and integrates well with Windows NT's user administrator.

According to CA, much of Remotely Possible's strength lies in its integration with Unicenter TNG. But for a standalone remote-control solution, Remotely Possible lacks the ease of use and capabilities provided by competitors such as Symantec's pcAnywhere.—*PB* PC

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Net Tools

Networks Made Easy

Lower prices, new technologies, and ease of use mean the time is right to connect your small- and home-office systems.

By Les Freed

Count the computers in your home. There's at least one PC in your home office and one in the kids' room, and maybe you tote a notebook to and from the office. You're fairly PC-savvy: You've set up the systems yourself, and at some point you've probably upgraded the operating system and opened a box to upgrade memory or a hard disk. You're thinking about employing a faster Internet-access method such as ISDN, a cable modem, or even a satellite dish—or about sharing your existing service. And if you work in a small office without full-time IS support, your knowledge is likely put to good use and you're relied upon to keep those systems running smoothly.

Now's the right time to set up a local area network (LAN), whether for the home or small office. Yes, a *LAN*. Networking your desktop PCs and laptops will give you the ability to share files, printers, Internet access, and expensive peripherals (such as an removable-cartridge or tape-backup drive).

For the small office, having a network means

ILLUSTRATION BY DENNIS HARMS

INSIDE

YOUR FIRST NETWORK: Contributing editors Les Freed and Bruce Brown test ten Ethernet and Fast Ethernet SOHO networking kits, plus five kits that use alternative technologies.

WANT ZERO ADMINISTRATION? Get it through NDS. Contributing editor Steve Rigney reviews Novell's Z.E.N.Works. *Page 231.*

EASY ISDN BANDWIDTH: Dual-analog routers let you share one 56-Kbps dial-up connection. Les Freed tests products from Netopia and Ramp Networks. *Page 231.*

INTRANETS FOR BEGINNERS: Now even a novice networker can set up a basic intranet. Contributor Michael Bender tests Lotus Domino Intranet Starter Pack. *Page 236.*

MANAGING GOES MOBILE: Now you can keep your mobile users' notebooks up to corporate specs. Rigney tests Mobile Automation's RightState 2.0, which makes it easy to manage roving systems. *Page 236.*

BIG BLUE STRIKES BACK: Finally, a Microsoft BackOffice challenger! Rigney tests IBM's Suites for Windows NT; find out how it stacks up. *Page 245.*

www.pcmag.com

NetTools Online

All files mentioned in this section are available for downloading from our Web site.

Net Tools

NETWORKING KITS

that everyone can share frequently accessed (and oft-changed) files, such as contact lists, customer databases, sales orders and invoices, and word-processing documents. For the home, having a network means you'll need only one printer for both you and the kids and only one modem (and phone line) to access the Internet. Many game titles include a multiplayer option, so you and the kids can zap aliens together—even from opposite ends of the house.

For this story, we tested 15 LAN connection kits geared to small-office/home-office (SOHO) users. For the most part, the packages provide thorough illustrated documentation, extended or lifetime warranties, and free telephone technical support. The Ethernet kits typically contain two network interface cards, cables, and a four-port hub—enough hardware to connect two desktop PCs, a printer, and a removable cartridge drive or notebook, for example.

We tested several networking kits based on some intriguing alternatives that employ radio waves, AC current, and telephone lines. These products typically contain enough hardware to connect two PCs, but make you add additional PCs and peripherals as you grow.

GO FOR THE COPPER

Once the sole province of larger businesses, LAN kits are the new darlings of the SOHO market for two reasons. First, Microsoft Windows 95 and NT 4.0 have print- and file-sharing services built right in, which eliminates the need for third-party networking software. (For guidance on setting this up, turn to "Windows Networking 101.") Second, LAN hardware prices have plummeted in recent years, in large part because of the extremely competitive market for LAN network interface cards (NICs).

Until recently, small-office networking kits were almost exclusively based on the 10Base-T Ethernet standard. This method uses inexpensive four-pair copper wiring—similar to telephone cable—to connect each PC to a central point called a *hub*. 10Base-T operates at 10 megabits per second (Mbps)—fast enough for small-office LAN tasks.

But 10 Mbps is too slow for large LANs and for bandwidth-intensive operations such as running streaming video and audio applications or playing some 3-D games. Enter Fast Ethernet, a 100-Mbps Ethernet variant that runs over existing 10Base-T cable. Though the first Fast Ethernet products were expensive, today prices are nearly on a par with 10-Mbps products. Six of the kits here use 10-Mbps Ethernet hardware, three use Fast Ethernet, and two—from NetGear and NDC Communications—each use 10/100 NICs and a 10-Mbps hub.

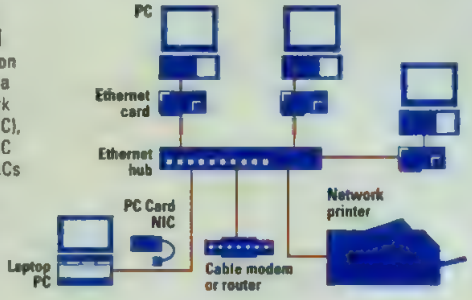
So which do you buy? At first glance Fast Ethernet seems the obvious choice: It's only $20 to $40 more expensive per computer. And because Fast Ethernet allows for greater bandwidth (meaning you get a wider pipe for data to pass through) it's much faster, thereby providing a superior upgrade path when you're ready to add a fast Internet-access service. If you roll out a full-strength Fast Ethernet LAN today, though, you might have compatibility problems with other network devices. Legacy 10-Mbps equipment, such as print servers, PC Card NICs, and ISA NICs won't work, nor will low-end ISDN routers.

Fast Ethernet is tempting and certainly the best choice if you're shuttling large graphics, audio, or video files. But rest assured, plain Ethernet is just fine for sharing printers, files, and a 56-Kbps dial-up connection. If you're still torn, or you think you may need the extra bandwidth in the near future, consider the compromise solutions offered by NetGear (our Editors' Choice) and D-Link Systems. The kits include 10/100 NICs and a 10-Mbps hub. This setup is 10 Mbps–compatible, and when it's time to up-

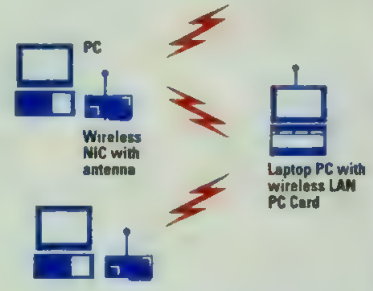
How Networking Technologies Work

Each of the four networking technologies in this roundup transmits data between devices in a different way.

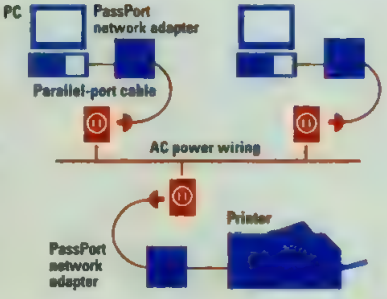
TRADITIONAL ETHERNET LAN
Each desktop PC on the LAN contains a PCI or ISA network interface card (NIC), and laptops use PC Card NICs. The NICs connect to an Ethernet hub via copper cable.



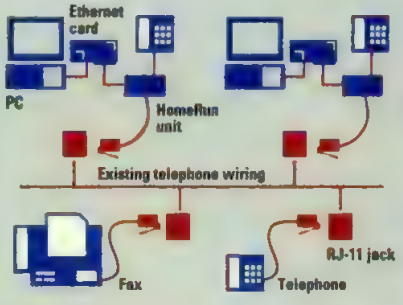
RADIO FREQUENCY WIRELESS LAN
Each PC and laptop on the network contains a wireless NIC, which combines the functions of a traditional NIC with a radio transmitter and receiver. Because the radio signals use very little power, they operate over a limited range, typically 300 feet or less.



AC POWER
The Intelogis PassPort Plug-In Network uses existing electrical wiring in place of Ethernet copper cabling. PassPort units communicate with one another by sending a low-power (and low-speed) radio signal over the AC power wires. The PassPort network adapters let you connect PCs via the parallel port, obviating the need to open the PC.



TELEPHONE LINES
The Tut HomeRun uses a DSL-like technology to piggyback a fast (1.3-Mbps) network signal atop existing telephone wiring without interfering with phone service. Each PC uses a standard NIC card and connects to an external adapter that attaches to the phone line via an RJ-11 jack.



grade to Fast Ethernet, you simply upgrade the hub to a 100-Mbps model, at a cost of only about $50.

LOOK MA, NO WIRES!

Whether it's 10 or 100 Mbps, the trouble with Ethernet is the wires. It's easy and inexpensive to connect several PCs in the same room or in adjoining rooms by running cabling along the baseboards. But if you want a neater look, it'll cost you: Get an estimate from an electrician or burglar-alarm company before you buy an Ethernet kit, and be sure to factor it in to the total cost of your LAN solution.

Even if cost isn't a detractor, there are many settings where running cabling is inappropriate, such as temporary offices and home and office rentals. Therefore, we also tested some first-generation non-Ethernet products (three shipping and two in beta) that use radio waves, electrical power, and telephone lines to transmit data.

Three products—those from Proxim, RadioLAN, and WebGear—are truly wireless, using microwave-frequency radio-wave technology to transmit data, also called radio frequency (RF). Though wireless LANs have been a mainstay in some industries for years, high price tags have kept the products out of the SOHO marketplace. If you're intrigued by a wireless solution but are put off by first-generation offerings, consider the more traditional products reviewed in "Wireless Meets the Small Business." Though considerably more expensive, they're tried and true.

Though Proxim and WebGear squarely target the small and home office, RadioLAN is geared more for business use. At a cost of roughly $350 per device, the product is by far the most expensive here. But because it's the only wireless product to deliver Ethernet performance and to do so for well under a thousand dollars, it is arguably a comparable or even superior value in the field.

Two other Ethernet alternatives, the Intelogis PassPort Plug-In Network and the Tut HomeRun Adapter, take different approaches, using the existing wiring infrastructure—power lines and phone lines, respectively—to hitch a ride for your LAN traffic. The PassPort is extremely easy to use; simply connect the unit to your PC's parallel port and plug the brick-sized adapter unit into a wall outlet.

The HomeRun (which we tested in beta) uses a technology similar to DSL (digital subscriber line) to piggyback a data signal on your existing phone wiring. Though the HomeRun is nearly twice as fast as the PassPort (1 Mbps rated speed as opposed to 350 Kbps rated speed), to use it you must install a 10Base-T Ethernet card in each PC.

One drawback the non-Ethernet products share is a lack of interoperability. In the case of RF products, efforts are underway to create a unified radio-frequency networking standard. (For details, see the sidebar "So Many Standards.") If running wires isn't an option, each of these non-Ethernet kits provides a workable LAN with minimal effort. But if you can wait a few more months, the next-generation offerings are sure to be cheaper, faster, and more reliable than what you'll find here. Moreover, this fall we expect to see a barrage of compatible radio-based wireless products that conform to the IEEE 802.11 wireless-networking standard.

THE SCOOP ON SHARING

Before you delve into the reviews, here's an important point about resource sharing: To share a printer or Internet connection on a LAN, you must designate a PC to host the device. That means for printers, the PC host must be turned on (and working) in order to send a job to the printer. For added flexibility and reliability, consider investing $150 to $250 for a print server. For details, turn to "Add a Little Print Server."

Perhaps more important, only a handful of kits here provide the additional software required to share an Internet connection, out of the box. If this is an important consideration, look to kits from Kingston Technology and Linksys on the Ethernet side, and Intelogis, Proxim, and WebGear for non-Ethernet. (Proxim addresses this issue head-on by providing an excellent 56K wireless modem in its kit.) You can also buy a third-party program such as Artisoft's i.Share. But modem-sharing software (sometimes called a *soft router*) requires you to connect the modem to a PC on the network, which can slow performance on the host. If you'd prefer a more robust solution, consider the hardware routers evaluated in "Share the Internet Connection?"

EDITORS'CHOICE

• NetGear Network Starter Kit SB 104

PC MAGAZINE EDITORS' CHOICE

It's hard to go wrong with any of these networking kits, but one in particular stands out as the best all-around solution. The NetGear Network Starter Kit SB 104 ($90 street) provides 10/100 NICs with an Ethernet hub, which makes it a snap to upgrade to Fast Ethernet should your needs expand later. Its Ethernet performance was excellent, with the Starter Kit finishing near the top on our tests, and at $45 per computer, it's the best value you'll find today, especially for a kit this jam-packed with features.

From start to finish, the Starter Kit shines. Whether you're brand-new to networking or an old hand, you'll appreciate NetGear's extensive documentation. It takes beginners by the hand, leading them step by illustrated step through the installation process. Experienced users will find the copious, detailed documentation full of useful information to answer almost any question. And unlike most other vendors, if you're stumped by a problem, NetGear provides round-the-clock toll-free technical support. When you're maintaining your own network—even a small one—reliable technical support is essential to keep it operating.

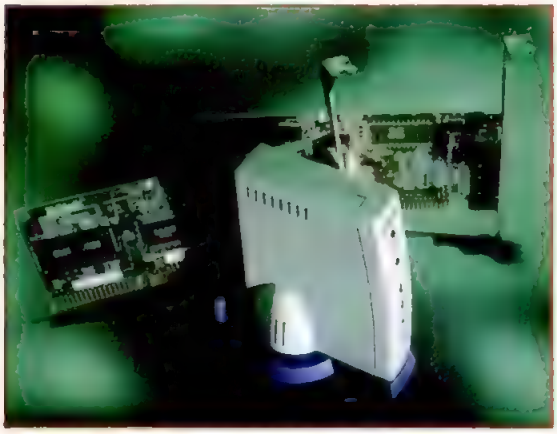
Three products deserve an honorable mention. We found the 3Com OfficeConnect Networking Kit ($120 street) comparable to the Starter Kit with regard to installation and documentation, but it didn't include 10/100 NICs and turned in relatively slow performance scores. If you need 100-Mbps speeds for fast Internet access, high-bandwidth applications, or larger networks, the Kingston Fast EtheRx 3-User Workgroup Bundle ($299 list) delivers stand-out Fast Ethernet performance, excellent documentation, and useful software, as well as three network interface cards.

And though this first generation of low-end non-Ethernet alternatives is sure to improve over time, the RadioLAN/10 ($349 list) provides both 10-Mbps speeds and stable performance today. If you can't wait for the other technologies to shake out or need Ethernet speeds in a non-Ethernet product, the RadioLAN product won't disappoint.

Ethernet Kits

D-Link DE-905 Network Kit For Small Workgroups, DFE-905 Network Kit In A Box

If saving money is your first order of business and you're confident in your ability to set up a small network, go with D-Link Systems. The 10-Mbps D-Link DE-905 Network Kit For Small Workgroups ($90 street) and the 100-Mbps D-Link DFE-905 Network Kit In A Box ($100 street) are low-priced products in their categories—only $45 to $50 per PC. Although you won't get many extras, each kit provides all you need to get a two-port (two-PC) network up and running. Notably, the 100-Mbps kit includes a 10/100 switched hub, not seen anywhere else in the roundup.



BARGAIN NETWORKS *Both D-Link kits offer the lowest price per computer in their respective categories.*

Each kit includes two network interface cards (NICs), two 20-foot cables, a hub, a driver disk with all the Windows variants, and NetWare. Documentation is adequate, covering all the bases, but it lacks the hand-holding and copious illustrations you'll find in the manuals from NetGear and 3Com Corp. In testing, both kits were about average for their classes.

Installation of the 10-Mbps DE-905 kit was without incident. We simply inserted the plug-and-play ISA cards, turned on the PC, and let Windows 95 install the default drivers. The DE-905 was one of the few kits lacking diagnostic software, but D-Link provides each kit with a lifetime warranty in case there's trouble.

The five-port 10-Mbps hub is housed in an attractive plastic case that stands upright. The hub can draw power either from the supplied wall transformer or from a keyboard adapter cable that steals DC power from one of your PCs, thereby lessening cable clutter. The hub contains LEDs to indicate activity for each of its five ports but lacks an uplink port, so you can't connect another hub if you grow out of this configuration.

D-Link's Fast Ethernet version, the DFE-905, costs only $5 more per PC. Installing the kit's 10/100-Mbps PCI NICs was uneventful; Windows detected them without a hitch. In addition to the drivers, the DFE-905 includes a DOS-based diagnostic program that lets you do basic troubleshooting on the cards and network connection.

The DFE-905's four-port 100-Mbps hub has five connectors: four for attaching PCs and a fifth that serves as an uplink port for attaching a second hub. The D-Link Fast Ethernet hub is unique here as the only product to include a switch for selecting either 10-Mbps or 100-Mbps operation, useful for connecting 10-Mbps devices.

D-Link's kits offer cost-conscious buyers complete networking solutions for the lowest prices around.—*Les Freed*

D-Link DE-905 Network Kit For Small Workgroups. Street price: $90. **D-Link DFE-905 Network Kit In A Box.** Street price: $100. D-Link Systems Inc., Irvine, CA; 800-326-1688, 718-455-1688; fax, 718-455-2521; www.dlink.com. *905 at www.pcmag.com/infolink.*

Kingston EtheRx 3-User SOHO Bundle, Fast EtheRx 3-User Workgroup Bundle

A pioneer in this market is Kingston Technology Co., which has been offering budget-priced Ethernet networking kits since 1993. With so much experience, it's no wonder the Kingston EtheRx 3-User SOHO Bundle ($139 list) and the Kingston Fast EtheRx 3-User Workgroup Bundle ($299 list) are so exceptional, with thorough documentation, useful utilities, and excellent performance.

GROUPS OF THREE *The Kingston kits are the only ones to include hardware for a three-node network.*

SUITABILITY TO TASK

ETHERNET NON-ETHERNET	D-Link DE-905 Network Kit For Small Workgroups	D-Link DFE-905 Network Kit In A Box	Kingston EtheRx 3-User SOHO Bundle	Kingston Fast EtheRx 3-User Workgroup Bundle	Linksys Instant Ethernet Series Network Starter Kit	Linksys Instant EtherFast Series Network Starter Kit
Installation and documentation	Good	Good	Excellent	Excellent	Good	Good
Software and support	Good	Good	Excellent	Excellent	Good	Good
Flexibility	Fair	Fair	Fair	Fair	Fair	Fair
Expandability	Good	Excellent	Good	Good	Good	Excellent
Performance	Good	Excellent	Good	Excellent	Good	Excellent

For **installation and documentation,** we consider everything it takes to get a small network up and running. We examine all the components included with the kit. Connectors should be clearly labeled, and well-written documentation that includes useful illustrations is important. We prefer solutions that plug directly into the computer over those that require the user to open the case and install a network interface card (NIC).

The kits provide a range of **software and support.** The best packages use setup wizards that include tools for checking links between computers. Additional utilities for modem and printer sharing are a plus. Although the products should be easy to use, free phone support and a lengthy warranty are also valuable.

Flexibility is important for implementing a network in various small-office settings. Ethernet is stable and dependable, but running the necessary cables is sometimes inconve-

NETWORKINGBASICS

Windows Networking 101

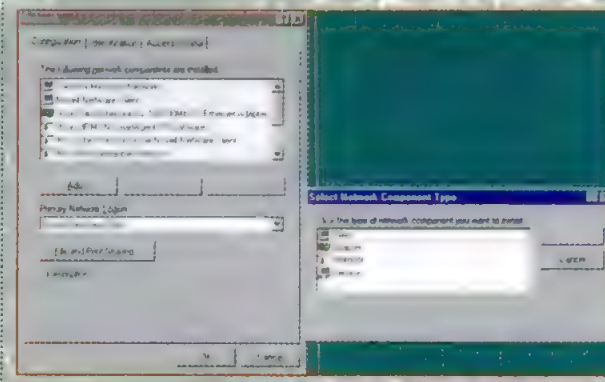
The Ethernet kits in the main roundup provide you with all the hardware you need to set up a small LAN, but they leave the software—namely, the network operating system (NOS)—up to you. Fortunately, if you're running Microsoft Windows 95 or 98, peer-to-peer networking is built right in. Here's a quick primer on how to set it up.

Before getting started, you need to make sure that Windows recognizes your network adapter (also called *the network interface card* or *NIC*). Most new network adapters adhere to the Plug and Play specification, which means Windows should detect the new device upon installation. To be sure, open Control Panel and select the Network icon. You should see an entry for the NIC. If you don't, click on the Add New Hardware icon (also in Control Panel), then follow the wizard's steps for adding the device. If Windows fails to detect the card this way, you'll need to use the installation wizard included on your NIC driver disk.

Upon recognizing the card, Windows will automatically install IPX/SPX. This is the default networking protocol that allows your PCs to communicate. Windows will also install the network *requester* (client). The default requester is the Client for Microsoft Networks, which lets your PC communicate with systems using Microsoft Windows 95, 98, or NT.

From the Network applet's Configuration tab, you also have the option of adding the TCP/IP protocol to enable Internet access or the NetBEUI protocol to communicate with PCs running versions of Windows older than Windows for Workgroups.

Next, in order to let your networked PCs share resources, you must install the resource-sharing software on each system. From the Network applet's Configuration tab, highlight Client for Microsoft Networks, select Add, click on Service, then click on Add again. Then select Microsoft from the left-hand pane and the File and Printer Sharing for Microsoft Networks option from the right pane, and restart the system.



Networking Command *You add your network adapters, protocols, and software through the Network Control Panel applet.*

The final step involves granting shared access to each resource. The easiest way to do this is from Windows Explorer: Highlight the drive or printer you want to share, click the right mouse button and choose the Sharing option, and then give the resource a name. This will allow it to appear in the Network Neighborhood folder, where it can be accessed by others.—*Steve Rigney*

Unlike the competition, Kingston includes three NICs in each kit, so it's the only choice if you need an out-of-the-box three-node network solution. The kits' price per computer is comparable with the prices of the two-node Ethernet kits, and at only $47 per PC, the EtheRx SOHO Bundle is one of the cheapest 10-Mbps kit we tested.

The printed documentation for both kits is outstanding, offering comprehensive diagnostic and cabling information, as well as simple tutorials to walk you through the install process and other network-setup tasks. The kits are good for users of non–Microsoft Windows equipment, as both come with the most complete set of drivers we saw.

Kingston includes StarTech modem-sharing software, as well as the DOS-based diagnostics and configuration utility Qstart. Qstart provides simple, menu-driven network diagnostics and provides granular control over NIC installation, letting you override the plug-and-play settings in case of an IRQ conflict. Moreover, Kingston provides toll-free tech support and a lifetime limited warranty.

We installed each 10-Mbps EtheRx ISA card easily. After inserting the card and rebooting, Windows 95 auto-installed the necessary driver. The EtheRx hub is a small, plastic box with five 10Base-T connectors. There's

EDITORS' CHOICE

NDC SOHOware Network PCI Starter Kit	NDC SOHOware Network Fast Ethernet Starter Kit	NetGear Network Starter Kit SB 104	3Com OfficeConnect Networking Kit (4-port)	Intelogis PassPort Plug-In Network	RadioLAN/10	WebGear Aviator Wireless Network Kit
Good	Good	Excellent	Excellent	Excellent	Good	Good
Good	Good	Good	Excellent	Excellent	Good	Excellent
Fair	Fair	Fair	Fair	Good	Excellent	Fair
Excellent	Excellent	Good	Good	Excellent	Excellent	Good
Good	Excellent	Good	Good	Fair	Good	Fair

nient or impossible. For this reason, we give the Ethernet kits a rating of fair. This isn't to say that non-Ethernet solutions are inherently more flexible. Radio-frequency solutions suffer limitations in range and in their ability to transmit signals through some wall materials. And AC and phone-line products rely on the availability of pre-existing phone and power outlets.

The ability to grow should be built into any network. For **expandability**, we evaluate how easily the product lets you add more computers and peripherals to the network. We look for uplink ports on the Ethernet hubs and for drivers for multiple OSs.

The **performance** rating is based on the throughput numbers from our testing (for details, see "Performance Tests"). We conclude that even the slowest performer, the WebGear Aviator Wireless Network Kit, is adequate for transferring small files.

also a switch that lets you convert one of the ports to an uplink to add a second hub. The hub is so lightweight that Kingston includes a strip of Velcro for fastening it almost anywhere.

Kingston's EtheRx Workgroup Bundle targets the small business that needs Fast Ethernet power. It includes three EtheRx PCI 10/100 LAN cards, an EtheRx Workgroup four-port 100-Mbps hub (one port doubles as an uplink), and three cables. There's also a convenient CD-ROM with all the drivers and detailed product information for all of Kingston's network products. The hub is housed in an industrial-strength metal case with indicators on the front panel that display activity and collisions, as well as five utilization lights, which show the total amount of traffic on the network.

Excellent documentation, utilities, and support make the SOHO Bundle and the Workgroup Bundle good choices, especially for three-node networks.—*LF*

Kingston EtheRx 3-User SOHO Bundle. List price: $139. **Kingston Fast EtheRx 3-User Workgroup Bundle.** List price: $299. Kingston Technology Co., Fountain Valley, CA; 800-435-2620, 714-435-2600; fax, 714-438-2720; www.kingston.com. *908 at www.pcmag.com/infolink.*

Linksys Instant Ethernet Series Network Starter Kit, Instant EtherFast Series Network Starter Kit

The networking kits from Linksys don't attract attention in any one area, but they are well-priced packages that delivered good performance. The 10-Mbps Linksys Instant Ethernet Series Network Starter Kit ($95 street) and the 100-Mbps Linksys Instant EtherFast Series Network Starter Kit ($140 street) were easy to install, but we found both packages to be a bit uneven overall. And the documentation might feel a little light, especially to users working through their maiden network installs.

The manual covers the necessary installation steps, but it doesn't include many screenshots or photographs and lacks guidance on how to access a shared printer. The 40-page user guide is better described as a pamphlet and doesn't walk you as carefully through the installation as NetGear's and 3Com's.

MIDDLE OF THE ROAD *The Linksys kits don't stand out, but they deliver good, cheap networking solutions.*

The single diagnostic utility is a somewhat cryptic DOS-based program inappropriate for networking beginners. There is a copy of Medley 97, though, a third-party utility that lets you share a single modem connection with your entire network. Drivers are included for most Microsoft Windows variants, NetWare, and OS/2.

The 10-Mbps Ethernet Starter Kit includes a five-port hub with an uplink port, two PCI cards with 10Base-T connectors, and two 15-foot bright-blue cables (which may clash with your decor). Oddly, if you use the uplink port to connect a PC instead of a hub, only four of the five ports will operate.

For those who opt for Fast Ethernet, Linksys offers the EtherFast Starter Kit, which includes two 100-Mbps cards and a four-port hub. On this hub one port does double duty, serving as either a PC connection or a hub uplink. Compared with the 10-Mbps hub, this device provides more detailed network status information, adding error and network-utilization LEDs to the connection indicator.

In addition to Medley 97, the EtherFast Starter Kit includes different diagnostic software. Though DOS-based, the utility presents NIC, system, and diagnostic information in a graphical format; we found it better geared to networking beginners than the Ethernet Starter Kit's utility.

In performance testing, both kits turned in respectable scores. The Ethernet Starter Kit led the Ethernet kits on NetBench but showed below-average results on the File

The Many Ways of Networking

Though Ethernet and Fast Ethernet are the cheapest, fastest, and most widespread networking solutions, many people may prefer the flexibility and convenience of a non-Ethernet solution. Here's how your choices match up.

Networking method	Connection technology	Price per PC	Claimed speed	Range (feet)
Ethernet kit	Copper cable	About $50	10 Mbps	300
Fast Ethernet kit	Copper cable	About $90	100 Mbps	300
Intelogis PassPort Plug-In Network	AC power lines	$100	350 Kbps	2,640
Tut HomeRun Adapter	Telephone lines	External, $170; internal, $150	1 Mbps	500
Proxim Symphony	RF signals	$150	1.6 Mbps	Indoors, 500; outdoors, 1,000
RadioLAN/10	RF signals	$350	10 Mbps	Indoors, 120; outdoors, 300
WebGear Aviator Wireless Network Kit	RF signals	$150	500 Kbps	75
Sneakernet	Physical transport of files between machines, usually on 3.5-inch floppy disk	About 80 cents per 1.44MB, 3.5-inch floppy disk	Walking time, plus data transfer at about 1 Mbps to and from floppy disk	Limited only by time and distance

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Net Tools
NETWORKING KITS

Copy test. The EtherFast Starter Kit topped the chart on the File Copy test, while lagging behind on NetBench.

Both Linksys kits are excellent buys, but if you need lots of hand-holding, the NetGear or 3Com Corp. offerings may serve you better.—*Bruce Brown*

Linksys Instant Ethernet Series Network Starter Kit. Street price: $95. **Linksys Instant EtherFast Series Network Starter Kit.** Street price: $140. Linksys Inc., Irvine, CA; 800-5465-797, 949-261-1288; fax, 949-261-8868; www.linksys.com. *909 at www.pcmag.com/infolink.*

NetGear Network Starter Kit SB 104

PC MAGAZINE EDITORS' CHOICE

With the NetGear Network Starter Kit SB 104 ($90 street), NetGear sets its sights unwaveringly on the entry-level networker—and this pays off. The 10-Mbps kit delivers the best mix of qualities we've seen. Providing two 10/100 PCI NICs and a 10-Mbps hub, this hardware combination offers a built-in upgrade path while sidestepping compatibility worries. Easy-to-understand heavily illustrated documentation ensures a faultless setup, and the kit is backed by unmatched technical support. Performance was excellent, and at only $45 per PC, the Starter Kit is the best value here. It wins our Editors' Choice.

We found the detailed installation guide extremely helpful. Click-by-click illustrations walked us smoothly through, and unlike most of the kits we tested, the documentation in-

NETWORKADDITIONS

Add a Little Print Server

Most small LANs share one printer that's connected directly to a PC. The trouble is, the host PC needs to remain on, and the printer must reside within about 15 feet. To increase flexibility and reliability, consider adding a print server. Here's the scoop on four solutions—three wired and one wireless.

The wired print servers are fairly inexpensive, providing a single 10Base-T network connection and one parallel port, plus support for a broad array of NOSs and protocols. The wireless solution costs more but lets you share multiple printers and doesn't require a network connection.

AXIS 540+

If flexibility and ease of use are most important, consider the Axis 540+ ($250 street). Similar to the Castelle unit, this device works with all of the major protocols, so it's appropriate for any network. Uniquely, the palm-size 540+ includes a built-in Web server that let us configure the device from a browser. And unlike the other print servers reviewed here, the 540+ connects directly to the printer's parallel port.

As with the HP and the Castelle, the unit includes simple-to-follow Windows configuration software. But the Web-based configuration was even easier: We simply assigned the 540+ an IP address, then pointed our browser to it. The clearly written documentation made using either method straightforward. (Axis Communications Inc., Woburn, MA; 800-444-2947, 781-938-6161; www.axisinc.com. *902 at www.pcmag.com/infolink.*)

CASTELLE LANPRESS 1P/10BT

If you're a bit more network-savvy and looking to come in under budget, the palm-size Castelle LANpress 1P/10BT ($170 street) is for you. The device is versatile yet powerful, and works with the TCP/IP, IPX, and NetBEUI protocols.

The package includes a detailed manual, but to get started, you'll need to know the protocol you want to use and the name of the printer. As with the 540+, you'll also have to install special printer drivers on your Windows 95 PCs if you want to print using the TCP/IP protocol. (Castelle Inc., Santa Clara, CA; 800-289-7555, 408-492-1964; www.castelle.com. *904 at www.pcmag.com/infolink.*)

FINE PRINT *Print servers from Axis, Castelle, HP, and Aerocomm take the printer burden off a network PC.*

HP JETDIRECT 150X

Small networks with an HP printer that use the IPX/SPX protocol have an easy choice in the HP JetDirect 150X ($150 street). The device offers easy-to-use configuration software and excellent documentation at a low price. Though not as small as the LANpress, it should fit behind most printers. The JetDirect works with Microsoft Windows 95 or NT or with Novell's NetWare, but it doesn't support TCP/IP or NetBEUI.

The JetDirect is easy to install. Its HP JetAdmin software provides a wizard-based interface. We simply made sure that IPX was enabled and the proper printer drivers were installed. (Hewlett-Packard Co., Palo Alto, CA; 800-387-3867, 650-857-1501; www.hp.com. *906 at www.pcmag.com/infolink.*)

AEROCOMM GOPRINT/EZ

The AeroComm GoPrint/EZ wireless print server lets you send a print job from any DOS- or Windows-based PC—without requiring an existing LAN. Simply plug a wireless adapter into each device you want to share. Each adapter ($130 street) is about the size of an external modem and includes a single parallel port. With a 125-foot indoor range, the GoPrint/EZ is ideal for sharing a printer that's tucked in an out-of-the-way location.

To share a printer, connect it to a GoPrint/ EZ adapter, then connect a GoPrint/EZ computer adapter to each PC. You'll need the bundled software to configure each printer with a channel ID and a unique name. This lets you give any PC access to any printer channel. The GoPrint/EZ provides 4 channels, letting you add up to 4 printers and 32 PCs. (AeroComm Inc., Lenexa, KS; 800-492-2320; www.aerocomm.com. *900 at www.pcmag.com/infolink.*)—*SR*

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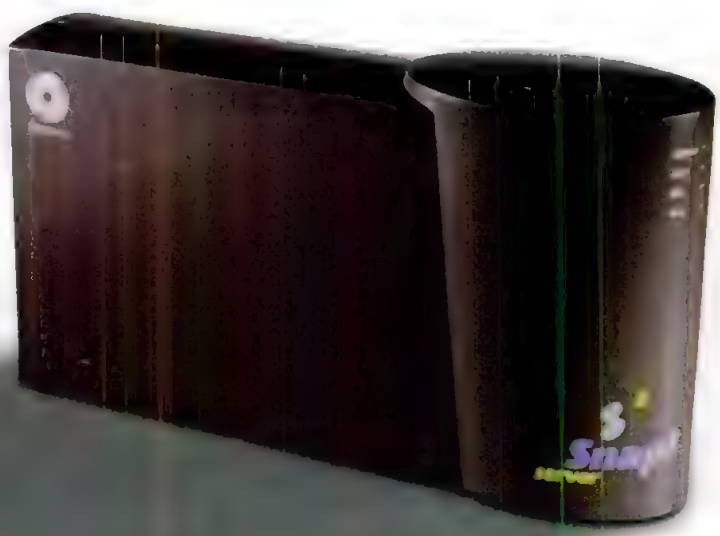

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BEST BUY: *The NetGear SB 104 serves up excellent features at a rock-bottom price.*

cludes a tutorial on printer sharing and configuring access to shared printers.

The manual also helps you to get the best performance. When we rebooted our PC after installing the NetGear NIC, Microsoft Windows 95 tried to load a generic NIC driver. The manual warned us this might happen and then walked us through substituting the NetGear-specific driver. The SB 104 also includes a simple DOS-based diagnostic utility to help troubleshoot network problems. If you need assistance, NetGear is the only company here to provide 24-hour, toll-free technical support and a lifetime warranty.

Besides the 10/100 NICs, the Starter Kit hardware includes two 25-foot cables and a small, blue four-port hub with an uplink port. The PCI-based SB 104 turned in fine performance scores, coming in second on the File Copy Test and trailing the leaders slightly on the NetBench test.

NetGear has announced a Fast Ethernet bundle that was not ready in time for testing but should be available by press time. It is slated to include a 100-Mbps four-port hub and two 10/100-Mbps PCI NICs.

If you want to start out with Ethernet but

NETWORKADDITIONS

Share the Internet Connection?

If sharing an Internet connection is one of the big reasons you're setting up a LAN, there's a good chance you'll be dissatisfied with the offerings in our main story. Although modem sharing software is inexpensive (or even free), the PC that hosts the software will take a noticeable performance hit whenever the Internet connection is active.

Fortunately, there are several dedicated hardware devices that will let you share an Internet connection without slowing throughput or breaking your bank. Here's a look at two good solutions: the Linksys Internet Workgroup Hub and the Ramp Networks WebRamp M3. The Workgroup Hub lets you share one analog connection and is best for the smallest LANs, and the WebRamp lets you share three analog or ISDN connections, which makes it more appropriate for larger settings.

LINKSYS INTERNET WORKGROUP HUB

The Linksys InternetWorkgroup Hub ($220 street) includes a single analog modem connection and a four-port 10Base-T hub. The device is limited to about six simultaneous connections and doesn't work with ISDN, which makes it less appropriate for bandwidth-intensive use. We found the unit extremely easy to set up: Documentation consists of an extensive detailed manual with information ranging from a glossary to helpful instructions on setting up Windows 95 peer-to-peer networking. To complete the installation, you must load additional software onto each Windows 95 and NT client PC.

The Workgroup Hub's feature set has two limitations worth noting, though. Unlike the WebRamp, there's no dial-on-demand capability and no DHCP server, which means you'll have to add IP addresses manually to each PC. Although this step is well documented in the manual, most less experienced users will nonetheless find it confusing. And the Workgroup Hub can make only one FTP connection at a time because of the bandwidth limitations of analog modems, so look elsewhere if you do heavy downloading. (Linksys Inc., Irvine, CA; 800-5465-797, 714-261-1288; fax, 714-261-8868; www.linksys.com. *909 at www.pcmag.com/infolink.*)

SHARE AND SHARE ALIKE *Linksys and Ramp Networks provide hardware devices to share an Internet connection.*

RAMP NETWORKS WEBRAMP M3

The Ramp Networks WebRamp M3 ($440 street) is more expensive, but with connections for up to three analog or ISDN modems, it offers a more flexible solution well suited to larger workgroups. In addition to a four-port 10Base-T hub, the WebRamp includes an internal DHCP server for assigning IP addresses to users automatically.

The WebRamp's implementation of COLT (Connection Optimized Link Technology) lets it increase the modems' performance while loading Web pages by instructing each modem to download a different part of the Web page. (One modem will download the banners while the other downloads the links, for instance.)

Note, however, that COLT is Web-specific and does nothing to increase performance of other connections such as e-mail, telnet, or FTP.

Moreover, the WebRamp doesn't currently work with the Multilink Point-to-Point Protocol (MPP), which combines the bandwidth of two dial-in connections to create a faster aggregate pipe. Nevertheless, the current available bandwidth should be enough for most small groups.

The WebRamp includes easy-to-use management and configuration software for both Windows and Macintosh PCs. The software will automatically set up your PC to access the WebRamp, and a dial-on-demand feature not found in the Workgroup Hub means it'll load automatically each time you make a connection. (Ramp Networks, Santa Clara, CA; 408-988-5353; fax, 408-988-6363; www.rampnet.com. *913 at www.pcmag.com/infolink.*)—*SR*

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envision a Fast Ethernet upgrade in the future, the Starter Kit will no doubt please.—*BB*

NetGear Network Starter Kit SB 104. Street price: $90. NetGear, Santa Clara, CA; 888-638-4327, 408-988-2400; fax, 408-495-3397; www.netgear.baynetworks.com. *911 at www.pcmag.com/infolink.*

NDC SOHOware Network PCI Starter Kit, NDC SOHOware Network Fast Ethernet Starter Kit

NDC Communications' networking kits help simplify the choice between Ethernet and Fast Ethernet. The only differences between the NDC SOHOware Network PCI Starter Kit ($100 street) and the NDC SOHOware Network Fast Ethernet Starter Kit ($150 street) are the hub and the price. Both packages are good values, but the PCI Starter Kit's inclusion of 10/100-Mbps PCI NICs makes it the superior value.

We found installing both kits to be uneventful. In addition to two 10/100-Mbps PCI NICs, the packages include two 25-foot cables. The documentation provided sufficient explanations and screenshots to walk you through the process, and Microsoft Windows 95 recognized both sets of plug-and-play NICs without incident. The only noticeable omission in the documentation was a description of how to access a shared printer. Though the packages lack diagnostic software, NDC provides a lifetime limited warranty with toll-free technical support.

The five-port 10-Mbps and 100-Mbps NDC hubs are identical but for speed and LEDs. They each have link, partition, and collision LED indicators, though the 100-Mbps version adds network-utilization LEDs. Each contains uplink ports that let you connect up to 14 PCs to multiple hubs. The manual includes only basic information on network architecture and expansion, but the content is presented in a friendly, nonthreatening manner geared to first-time networkers.

On our tests, the 10-Mbps and 100-Mbps NDC kits each posted above-average performance, leading the competition on the File Copy Test but trailing slightly on NetBench.

For a low-cost network kit that makes an upgrade to Fast Ethernet as easy as changing a hub, the PCI Starter Kit is a smart buy. In case you're ready for 100-Mbps performance now, the Fast Ethernet Kit is also a good choice.—*BB*

NDC SOHOware Network PCI Starter Kit. Street price: $100. **NDC SOHOware Network Fast Ethernet Starter Kit.** Street price: $150. NDC Communications Inc., Sunnyvale, CA; 800-632-1118, 408-730-0888; fax, 408-730-0889; www.ndclan.com. *910 at www.pcmag.com/infolink.*

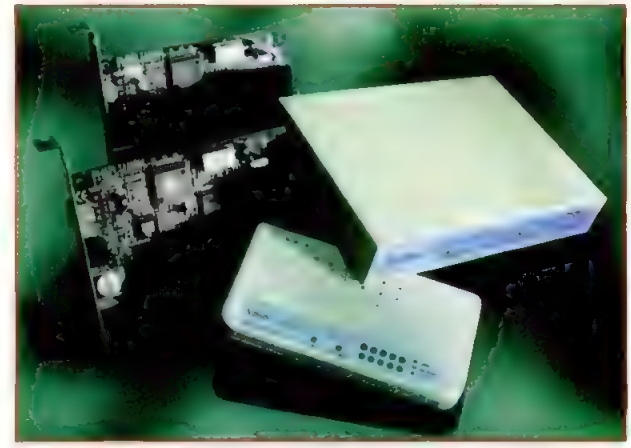
SIMPLE CHOICE *The only differences between the NDC kits are price and the speed of the included hub.*

3Com OfficeConnect Networking Kit

Are you a home or small-office user who wants to set up a two-node network quickly and easily? Then the 3Com OfficeConnect Networking Kit ($120 street) is for you. The OfficeConnect delivers class-leading documentation and a comprehensive Windows 95 Installation Wizard not found elsewhere. Although the package doesn't include 10/100 NICs to ease future upgrades to a Fast Ethernet network, 3Com Corp. has done everything possible to make the initial installation a breeze for even neophyte networkers.

As is often the case with 3Com products, the documentation was the best we saw. It is extremely thorough, to the point of suggesting that users remove jewelry before commencing setup to reduce dangerous static electricity. The documentation includes a 16-page Quick Steps pamphlet that's as complete as the full manuals of most other products, as well as an impressive bound user guide. The guide breaks down each hardware and software installation task into steps, each complimented by useful screenshots. Beyond the basics, it features comprehensive yet approachable information on network setup and expansion, as well as broader information on the potential uses of small networks.

To ease installation, the 3Com Setup Wizard performs a unique preinstallation test. If all the PCs pass, you can sit back and let the express installation automatically configure all the network settings for you. But if you have an older PC that is not capable of plug-and-play or if you choose to forgo the express installation, the Wizard will walk you though the configuration options. Once the network is up and running, you can search out problems with NICDoctor, a DOS-based utility that provides basic diagnostics. Should there be a problem you can't solve yourself, 3Com backs the kit with a lifetime warranty and toll-free technical support.



NOVICE FRIENDLY *The 3Com's exhaustive manual and excellent setup wizard will help just about anyone get a network up and running.*

On the hardware side, the OfficeConnect includes a four-port hub with an uplink port (for attaching a second hub), two 25-foot cables, and two 3Com ISA EtherLink NICs. Although the ISA cards make networking older machines easy, they slowed performance. The OfficeConnect finished toward the bottom of our tests when compared with other 10-Mbps Ethernet kits, but its speed was still acceptable, especially for the home market.

Home users and network beginners who want hands-off installation and the best documentation available will be well-served by the 3Com OfficeConnect Networking Kit.—*BB*

3Com OfficeConnect Networking Kit. Street price: Four-port version, $120. 3Com Corp., Santa Clara, CA; 800-638-3266, 408-326-5000; fax, 408-326-5001; www.3com.com. *914 at www.pcmag.com/infolink.*

Networking Kits

For smaller LANs in particular, fast performance might be less of an issue than a product's flexibility and range. The networking kits we tested offer a broad spectrum of rated throughput speeds—from 0.35 Mbps for the Intelogis PassPort to 100 Mbps for the systems using Fast Ethernet. Of the three non-Ethernet solutions, only the performance of the radio-frequency–based RadioLAN unit was on a par with the 10-Mbps Ethernet kits. Though the PassPort and WebGear Aviator were dramatically slower than the other units we tested, most home users will find their speeds adequate for transferring small files between PCs and sharing a printer or modem.

How We Tested

For the File Copy test, we used two Dell Dimension XPS P166S systems, with 2GB hard disks, 32MB of RAM, and both PCI and ISA slots. The File Copy test timed the transfer of a 17.5MB file between two PCs. Though the file was larger than those typically sent across a network, its size enabled us to measure the transfer speed using a stopwatch.

The rated speeds of these products are based on optimum conditions and don't factor in the overhead produced by the network protocol and operating system. Though TCP/IP was responsible for some overhead, most of it resulted from using Windows 95 with Peer-to-Peer Networking. When we loaded Windows NT 4.0 instead, speeds improved significantly.

The 10-Mbps Ethernet kits all demonstrated similar performance, within a 10 percent range, as did the 100-Mbps kits. We saw little difference between the ISA and PCI NICs, with the exception of the 10-Mbps ISA 3Com OfficeConnect, whose throughput was about 30 percent lower. 3Com confirmed our findings on transmitting large files. When we ran additional tests on other files, performance improved to within 10 percent of other kits.

Most wireless LAN products operate in the 2.4-GHz range to produce either 1- or 2-Mbps speeds. RadioLAN's 5.8-GHz technology is up to ten times as fast as most RF products. Our tests showed that the RadioLAN, at 5.75 Mbps, was only slightly behind the 10-Mbps Ethernet kits on the File Copy test.

The WebGear Aviator operates in the 902- to 928-MHz range, connects via parallel port, and includes file compression.

Transferring data over AC power lines, the Intelogis PassPort includes hardware encryption to ensure data security. We tested the device with encryption turned on and off, and detected no difference in throughput. The scores reflect throughput with compression turned off.

To test the speed of traffic across the network, we used the NIC test from NetBench 5.01. The 4K-block transfer scores mirrored those for the File Copy test, and as NetBench increased the size of the blocks to 16K and 32K, the Fast Ethernet devices achieved at least 41 Mbps—though still well below rated speeds. But we loaded Windows NT 4.0 on a computer acting as the server, throughput significantly improved.

—Analysis written by Kristina DeNike

▼ **In all cases, throughput** scores on the File Copy test fell far below the products' rated speeds. Most kits achieved roughly 60 percent of the vendors' claimed speeds, with the exception of the 100-Mbps kits, which managed only about 20 percent.

▼ **Though NetBench was designed** to run on Ethernet, we tried to use it to test the slower technologies, but the NIC test timed out during the initialization stage. Although the client requested the file using a variety of block sizes, we published only the 32K-block scores here.

Megabytes per second	Vendor-rated speed	File Copy	ZD NetBench NIC: 32K Block Size
AC POWER			
Intelogis PassPort Plug-In Network	0.35	0.13	N/A
RADIO FREQUENCY			
RadioLAN/10	10	5.75	N/A
WebGear Aviator Wireless Network Kit	0.5	0.07	N/A
ISA ETHERNET			
D-Link DE-905 Network Kit For Small Workgroups	10	6.52	7.69
Kingston EtheRx 3-User SOHO Bundle	10	6.42	7.48
3Com OfficeConnect Networking Kit	10	4.65	7.32
PCI ETHERNET			
Linksys Instant Ethernet Series Network Starter Kit	10	6.15	7.86
NDC SOHOware Network PCI Starter Kit	10	6.89	7.82
NetGear Network Starter Kit SB 104	10	6.83	7.12
PCI FAST ETHERNET			
D-Link DFE-905 Network Kit In A Box	100	20.09	44.17
Kingston Fast EtheRx 3-User Workgroup Bundle	100	19.94	44.02
Linksys Instant EtherFast Series Network Starter Kit	100	21.64	44.43
NDC SOHOware Network Fast Ethernet Starter Kit	100	22.29	41.73
		BETTER ▶	BETTER ▶

N/A—Not applicable. This product could not complete the test.

Non-Ethernet Kits

Intelogis PassPort Plug-In Network

Forget stringing copper cable; the Intelogis PassPort Plug-In Network ($249 list) uses your home's AC power wiring to connect PCs and printers into a network. The PassPort's 350-Kbps throughput is quite slow compared to Ethernet systems, but its price, relative flexibility, and ease of use make it a good choice for networking novices.

Each networked device attaches via a parallel port to an adapter housed in a white plastic case that plugs directly into an electrical outlet. The PC adapters are each attached to a six-foot cable, but you'll need to provide your own parallel cable for the printer. For $249 you get two PC adapters, one printer adapter, and two outlet strips; you can purchase additional PC and printer adapters for $100 and $50, respectively.

The PassPort's installation was simplicity itself: Plug the adapter into a wall outlet and connect the parallel port cable to your PC or printer. Intelogis recommends that you plug your networked devices into the included outlet strips, which contain shielding circuitry to prevent interference with the PassPort's signal. The documentation is similar to that of a home PC: glossy and friendly. The user guide contains all you need for the simple installation, but if you require more help, Intelogis also provides a service package with a lifetime limited warranty and toll-free technical support.

Once you connect the cables and reboot, you simply insert the driver disk when the wizard prompts you and stand by as the program installs the network drivers and software. Included is the PassPort Administrator utility, which lets you perform tasks—such as setting network devices' file- and print-sharing configurations—through an intuitive tree view. There's also Ositis Software's WinProxy program for sharing your Internet connection.

POWERED UP: *The Intelogis PassPort uses AC power lines to transmit data across the network.*

Testing proved the PassPort to be the second-slowest device in the roundup, just ahead of the WebGear Aviator Wireless Network Kit. Although inappropriate for sharing high-speed Internet-access devices such as cable modems, the PassPort's 0.13-Mbps throughput on the File Copy Test is adequate for most home-network tasks such as printer access, file sharing, and 56-Kbps Internet access.

Perhaps more important than speed is reliability. We found the product a bit picky about the location of the adapters. With all units in the same room, the PassPort functioned flawlessly, but when we moved one of our test PCs to another room, we weren't able to establish a connection. By following Intelogis's suggestion to move the unit to a different power outlet in the second room, we remedied the problem.

The PassPort is a good match for users who want a quick and easy networking solution and don't mind slower speeds.—*LF*

FORTHEFUTURE

So Many Standards

Unlike Ethernet, most of today's wireless products are proprietary systems that can't interoperate. Though there are technical reasons for incompatibility, it is primarily due to the lack of a unified industry-wide standard. At press time, we counted four unique groups hard at work creating new standards for networking products.

HOME RF GROUP

The Home RF group is approaching wireless from a consumer standpoint. The member companies are largely noncompetitive, including Compaq, Ericsson, Hewlett-Packard, IBM, Intel, Microsoft, Motorola, and Philips, as well as Proxim, the only wireless-LAN vendor represented. Their specification—the Shared Wireless Access Protocol (SWAP)—is designed to provide a wireless link between computers and consumer devices, including TVs, VCRs, and cordless phones. SWAP runs at 1 or 2 Mbps, which is fast for consumer applications but relatively slow for LAN traffic.

By building SWAP-compatible devices, member companies can provide integration between their products. We're not sure what a digital phone might have to say to a VCR, but at least SWAP assures vendors that their various devices won't conflict. SWAP's 2GB frequency puts its devices out of range of household appliances such as cellular phones. But more important, a standard SWAP chip set would greatly reduce costs for all SWAP-compliant devices.

IEEE 802.11

If you know your industry acronyms, you'll recognize the IEEE as the electronic industry's standards organization. In mid-1997 it released the IEEE 802.11 wireless networking standard. Unfortunately, many member companies felt that the 1- and 2-Mbps connection it defined was too little, too late. The few 802.11 devices announced thus far are expensive, starting at about $500 per PC. The IEEE has since returned to the drawing board to devise an 11-Mbps wireless standard, and 11-Mbps products are expected to follow this fall. Ironically, these devices aren't expected to interoperate with existing 802.11 devices.

BLUETOOTH

Bluetooth is named after the king who united Denmark as a single country. Its equally ambitious goal is to provide a unified, worldwide 1-Mbps communication standard for portable PCs, cellular phones, and PDAs. Member companies include Casio, Lucent Technologies, Motorola, Psion, 3Com Corp., Toshiba, and VLSI. Like SWAP, Bluetooth member companies intend to create an inexpensive, low-power chip set that vendors can build into their products at low cost.

HOME PHONELINE NETWORKING ALLIANCE

As we went to press, the Home Phoneline Networking Alliance (Home PNA was launched. Its goal is to create a home networking standard that connects PCs and peripherals over existing phone lines at 1 Mbps using Tut System's technology. Member companies include AT&T, Compaq, Hewlett-Packard, IBM, Intel, and Rockwell.—*LF*

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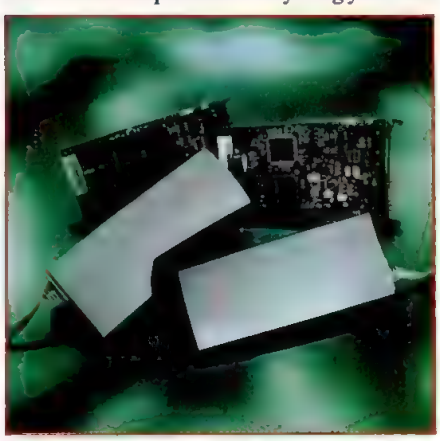
Intelogis PassPort Plug-In Network. List price: $295. Intelogis, Draper, UT; 888-756-5199; www.intelogis.com. *907 at www.pcmag.com/infolink.*

RadioLAN/10

Only one vendor here, RadioLAN, gives you a wireless LAN that delivers 10-Mbps speeds. Though each RadioLAN ISA card ($349 list) is pricey compared to the wired kits and even to other non-Ethernet products we tested, the RadioLAN product's value is clear. Many small office users will likely find the initial trade-off in cost and installation time well worth the payoff in convenience, flexibility, and of course, speed.

RadioLAN/10 uses a 5.6-GHz radio signal that covers a 120-foot radius in a typical building or up to 300 feet in unobstructed open space. The high frequency removes interference from consumer electronics that troubled the WebGear Aviator Wireless Network, and the units we tested easily transmitted through many types of walls. A RadioLAN network can have up to 128 nodes and connect to existing 10Base-T Ethernet networks using the BackboneLINK wireless hub ($1,000 list). In addition to the PC NICs, there's also a $449 PC Card NIC for portable users.

Though installation was slightly more involved than that of most other products, the documentation provides everything you need



PREMIUM: *The RadioLAN/10 is the only wireless product to deliver Ethernet speeds.*

to know. The process takes about 15 minutes per PC, as compared to 2 minutes per PC for the Intelogis PassPort Plug-In Network. To begin, you install the NIC in your PC and attach the antenna via a cable with a DB-15 connector. The RadioLAN antenna is roughly the size of a telephone handset and uses two receivers to overcome signal reflection that could cause dead zones.

After you connect the card and antenna, you reboot the PC and run the DOS-based setup program to set the I/O (input/output) addresses and IRQs (interrupt requests) for the NICs; there's no plug-and-play support. The program provides a quick communications test to make sure that the new card can talk to the other RadioLAN units in the building. Once you've installed and configured the NIC, you restart Microsoft Windows and load the RadioLAN network drivers as well as RadioNET, a Windows-based administration utility that lets you test communications and set options. Help is available from RadioLAN's toll-free technical support, but note, the product's one-year warranty is the shortest in the roundup.

Our sample RadioLAN units worked perfectly on the first try. In testing, the RadioLAN/10 performed as promised, generating 5.75-Mbps throughput in our File Copy Test. Along with Windows drivers, RadioLAN includes drivers for NetWare, making it the only non-Ethernet kit we tested able to connect directly to a NetWare file server.

Though the package is relatively expensive, the RadioLAN/10 is an excellent value for those who want Ethernet speeds in a wireless package.—*LF*

SUMMARY OF FEATURES

Networking Kits

ETHERNET NON-ETHERNET ■ YES ■ NO Products listed in review order	D-Link DE-905 Network Kit For Small Workgroups	D-Link DFE-905 Network Kit In A Box	Kingston EtheRx 3-User SOHO Bundle	Kingston Fast EtheRx 3-User Workgroup Bundle
Price of tested configuration (list/street)	$139 / $90	$159 / $100	$139 / N/A[1]	$299 / N/A[1]
Approximate price per computer	$45	$50	$47	$100
Number of computers supported in kit	2	2	3	3
Maximum number of computers supported	5	4	5	4
Technology	Ethernet	Ethernet, Fast Ethernet	Ethernet	Fast Ethernet
Connection type	PCI	ISA	ISA	PCI
Plug-and-play setup	■	■	■	■
Claimed data throughput	10 Mbps	10 Mbps or 100 Mbps	10 Mbps	100 Mbps
Dimensions of hub or port, in inches (HWD)	4.7 x 1.1 x 4.2	1.1 x 5.3 x 3.0	1.3 x 4.7 x 3.5	1.1 x 6.5 x 6.1
NOS drivers:				
Macintosh/Windows 3.x/WfWG	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Windows 95/Windows NT workstation	■ ■	■ ■	■ ■	■ ■
Windows NT/NetWare	■ ■	■ ■	■ ■	■ ■
OS/2 / Free BSD / Linux	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Encryption	■	■	■	■
Software for printer sharing	None	None	None	None
Software for modem sharing	None	None	StarTech	StarTech
Other included software	None	None	None	None
Product warranty	Lifetime	Lifetime	Lifetime	Lifetime
Technical-support number	949-788-0805	949-788-0805	800-435-0640	800-435-0640
Technical-support hours (eastern time)	9:00–6:00 M-F	9:00–6:00 M-F	6:00–6:00 M–F	6:00–6:00 M–F
Ethernet Kits				
Uplink port speed	10 Mbps	10 Mbps or 100 Mbps	10 Mbps	100 Mbps
Number of cables included	2	2	3	3
Type/length of cables (feet)	Category 5 / 20	Category 5 / 20	Category 5 / 25	Category 5 / 25
Wireless Kits				
Claimed maximum distance, in feet: computer-to-computer/computer-to-hub	N/A[3]	N/A[3]	N/A[3]	N/A[3]
Auto-reconnect	N/A[3]	N/A[3]	N/A[3]	N/A[3]
Point-to-point diagnostic software	N/A[3]	N/A[3]	N/A[3]	N/A[3]
Site survey tool	N/A[3]	N/A[3]	N/A[3]	N/A[3]

N/A[1]—Not applicable: The product does not have this feature. N/A[2]—Not applicable: This product is not an Ethernet kit.

RadioLAN/10. List price: $349. RadioLAN, Sunnyvale, CA; 888-272-3465, 408-524-0600; fax, 408-524-0600; www.radiolan.com. *912 at www.pcmag.com/infolink.*

WebGear Aviator Wireless Network Kit

WebGear's entry into the wireless networking market is the WebGear Aviator Wireless Network Kit ($299 list). Though its rated 500-Kbps speed is one of the slowest in the field, we found the Aviator adequate for most lightweight networking tasks. More important than performance in this case is reliability; the Aviator uses a 902- to 928-MHz radio signal, which testing proved to be quite finicky. On the whole, the package is a less-compelling choice than others here.

The kit includes two Aviator modules that plug into your PC's parallel port; additional modules are available ($150 street) for attaching numerous PCs. Though the device is simpler to install than a network interface card because you don't need to open the PC, the flexibility gained by utilizing the parallel port is diminished by the absence of a pass-through adapter, which means the device and printer (or removable-cartridge drive) can't share the port.

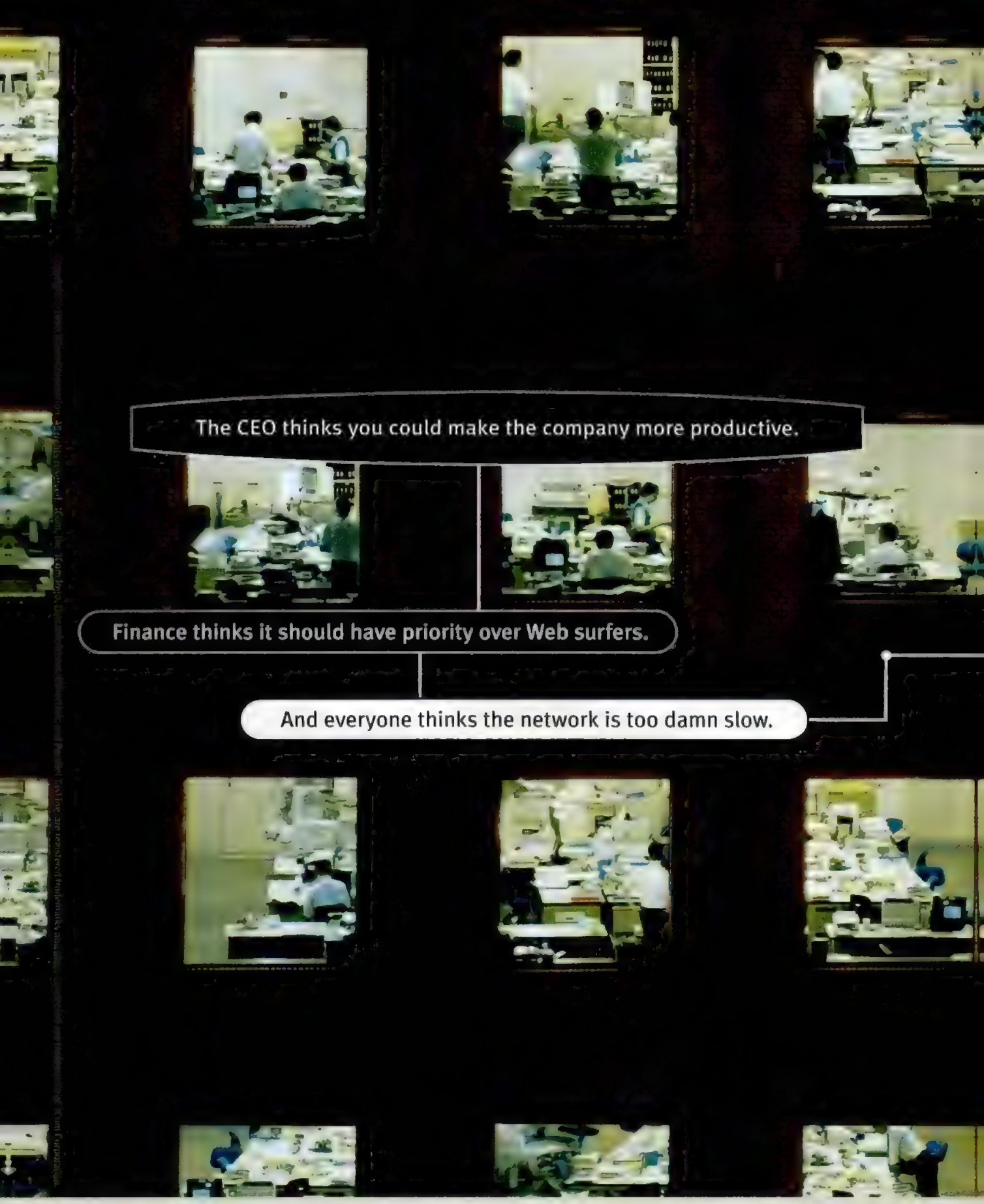
WebGear acknowledges the delicate reception of 900 MHz by providing 10- and 36-inch extension cables that let you position the modules away from the computer, to negotiate a better signal.

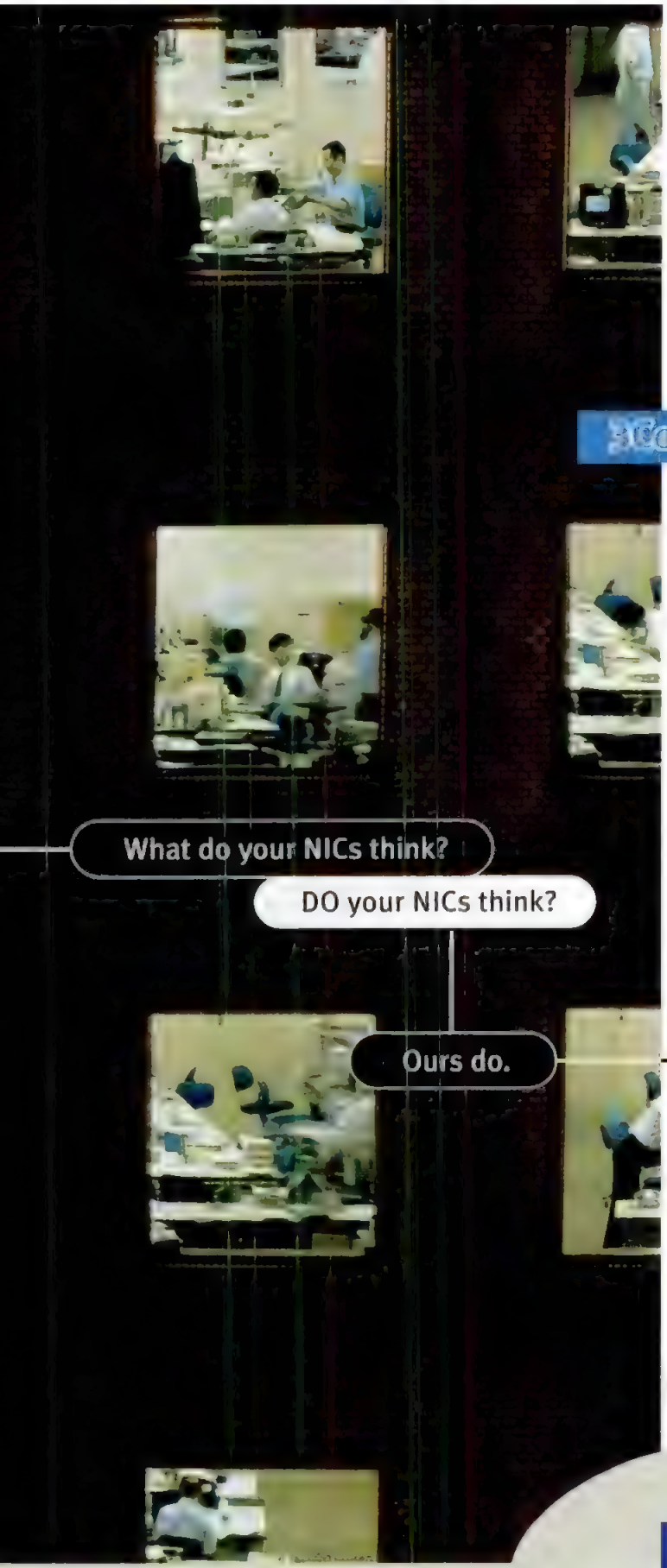
Many factors contributed to a difficult installation, some of which were eased by WebGear's installation wizards and diagnostic

See www.pcmag.com for interactive views

	Linksys Instant Ethernet Series Network Starter Kit	Linksys Instant EtherFast Series Network Starter Kit	NDC SOHOware Network PCI Starter Kit	NDC SOHOware Network Fast Ethernet Starter Kit	NetGear Network Starter Kit SB 104 (PC MAGAZINE EDITORS' CHOICE)	3Com OfficeConnect Networking Kit	Intelogis PassPort Plug-In Network	RadioLAN/10	WebGear Aviator Wireless Network Kit
	$149 / $95	$219 / $140	$119 / $100	$169 / $150	$129 / $90	N/A[1] / $120	$249 / N/A[1]	$698 / N/A[1]	$299 / N/A[1]
	$47	$70	$50	$75	$45	$60	$100	$350	$150
	2	2	2	2	2	2	2	2	2
	5	4	5	5	4	4	20	128	32
	Ethernet	Fast Ethernet	Ethernet	Fast Ethernet	Ethernet	Ethernet	AC power line	Radio frequency	Radio frequency
	PCI	PCI	PCI	PCI	PCI	ISA	Parallel port	ISA	Parallel port
	■	■	■	■	■	■	■	■	■
	10 Mbps	100 Mbps	10 Mbps	100 Mbps	10 Mbps	10 Mbps	350 Kbps	10 Mbps	150 Kbps
	1.2 x 5.0 x 3.8	1.2 x 6.9 x 5.0	1.0 x 4.9 x 2.6	1.3 x 6.3 x 4.8	1.1 x 3.7 x 4.0	1.4 x 8.7 x 5.3	5.1 x 2.3 x 3.7	N/A[1]	N/A[1]
	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
	■	■	■	■	■	■	■	■	■
	None	None	None	None	None	None	PassPort Networking Software	None	None
	MangoSoft's Medley	MangoSoft's Medley	None	None	None	None	PassPort Internet by WinProxy 2.1	None	Technocratix WebEtc.
	None	Network Diagnostic	Drivers for Lantastic, SCO Unix, and TCP/IP	Drivers for Lantastic, SCO Unix, and TCP/IP	Drivers for Lantastic and SCO UNIX	3Com Installation Wizard for Windows 95	None	RadioLAN's RadioNET Manager	None
	5 years	5 years	Lifetime	Lifetime	Lifetime	Lifetime	Lifetime	1 year	5 years
	949-261-1288	949-261-1288	800-632-1118	800-632-1118	800-638-4327	800-638-3288	888-571-4005	888-272-3465	888-947-8778
	10:00–8:00 M–F, noon–4:00 Sat.	10:00–8:00 M–F, noon–4:00 Sat.	10:30–9:30 M–F, 8:00 A.M.–midnight Sat.–Sun.	10:30–9:30 M–F, 8:00 A.M.–midnight Sat.–Sun	24 hours, 7 days	9:00–8:00 M–F	Noon–10:00 P.M. M–F	10:00–10:00 M–F	8:00–5:00 M–F
	10 Mbps	100 Mbps	10 Mbps	100 Mbps	10 Mbps	10 Mbps	N/A[2]	N/A[2]	N/A[2]
	2	2	2	2	2	2	N/A[2]	N/A[2]	N/A[2]
	Category 5 / 15	Category 5 / 15	Category 5 / 25	Category 5 / 25	Category 5 / 25	Category 5 / 25	N/A[2]	N/A[2]	N/A[2]
	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	120 / N/A[1]	75 / 125
	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	■	■
	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	■	■
	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	N/A[3]	■	■

N/A[2]—Not applicable: This product is not a wireless kit.


The CEO thinks you could make the company more productive.
Finance thinks it should have priority over Web surfers.
And everyone thinks the network is too damn slow.



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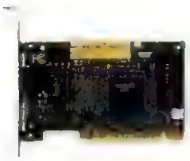

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software. As with the RadioLAN/10, installation required multiple reboots, but the wizard restarts the computer each time, picking up where the set-up process left off. Because the Aviator uses 902- to 928-MHz radio transmissions, we found that some 900-MHz cellular phones and pagers interfered with the network connection, when they were in use. And since the wavelength of the Aviator's signal is about one foot in length, we found that repositioning the module a bit to the left or right could significantly affect the strength of the signal. This is similar to what you'd experience with a small AM transistor radio. The range between Aviator modules is up to 75 feet in diameter, but testing showed that metal desks and file cabinets lessen the range considerably. The diagnostic software's graphical interface made it easier to position the modules optimally, though. The package provides a five-year warranty and toll-free technical-support.

SIGNAL DOCTOR: *WebGear's graphical diagnostic utilities help work out the kinks in a tricky installation.*

The Aviator includes Technocratix's Web-Etc modem-sharing software; the Aviator manual fully covers the program and gives specific instructions on how best to use Web-Etc with the Aviator network. With a throughput of 0.07 Mbps on our tests, the device finished at the bottom of the pack.

Appropriate only for networks that have a low bandwidth demand, the Aviator's competitive price and helpful utilities make it a reasonable choice, though other kits are superior.—*BB*

WebGear Aviator Wireless Network Kit. List price: $299. WebGear, San Jose, CA; 408-271-9888; fax, 408-271-1598; www.webgear.com. *916 at www.pcmag.com/infolink.*

HIGH-ENDWIRELESS

Wireless Meets the Small Business

The wireless kits in the main roundup are fine for sharing a handful of devices, but for connecting dozens of PCs across a large area, you need an industrial-strength solution such as the Aironet 3500 Series or the BreezeCOM BreezeNET PRO. Built to extend an existing LAN, these products consist of an access point that connects to the wired network, and PC Cards or adapters installed on each machine.

Aironet Wireless Communication's low-cost offering is the **Aironet 3500 Series,** which consists of the Ethernet AP-3500 access point ($1,800 street) and the PC-3500 PC Card adapter ($600 street). To connect to the wired LAN, the unit provides BNC, STP, and 10Base-T connectors. The 3500 Series offers a top speed of 2 Mbps and operates using Frequency Hopping Spread Spectrum (FHSS) in the 2.4-GHz band.

The PC-3500 uses a clip-on antenna that can transmit as far as 2,000 feet in an open space or 150 feet in a dense office. The AP-3500 provides two omnidirectional diversity antennas that provide a transmittal range of 500 to 1,000 feet.

The PC-3500 was easy to install: We simply inserted the card into the notebook and installed the correct drivers. The AP-3500 access point was more difficult to install, because it required that we assign it a specific ID to differentiate it from other wireless devices on the network. Fortunately, we could do this via a PC attached to the device's serial port. The access point includes a built-in Web server that let us configure and manage it from a standard browser—a feature not found in the BreezeNET PRO. (Aironet Wireless Communications Inc., Fairlawn, OH; 800-247-6638, 330-664-7900; www.aironet.com. *901 at www.pcmag.com/infolink.*)

THE NEXT STEP UP: *The Aironet 3500 Series and BreezeNET PRO family offer wireless solutions for larger networks.*

As with Aironet's devices, the **BreezeNET PRO** family uses the FHSS technique to transmit in the 2.4-GHz frequency band. The BreezeNET PRO products include the SA-PC Pro PC Card adapter ($570 street), the SA-10 PRO single-port station adapter ($700 street), an SA-40 PRO four-port station adapter ($1,200 street), the AP-10 access point ($1,500 street), and even a WB-10 PRO wireless bridge ($2,000 street).

The access points and station adapters are external devices that transmit data at a top speed of 3 Mbps. (The PC Card is currently limited to 2 Mbps.) The devices provide at least one 10Base-T port for connecting to a PC. The access point and PC cards include dual antennas and can cover a distance of 200 to 600 feet indoors. Useful LEDs helped us determine the best location—a feature lacking in the 3500 Series.

The ease of the BreezeNET PRO installation depends on your setup. For example, to connect two notebooks, all we had to do was install the PC Cards, add the driver, and browse the network. But adding multiple access points or setting up management required us to connect a terminal to the units and change multiple settings. (BreezeCOM Inc., Carlsbad, CA; 760-431-9880; www.breezecom.com. *903 at www.pcmag.com/infolink.*)—*SR*

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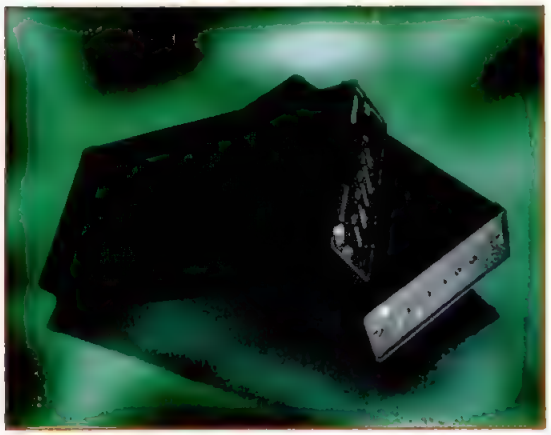
Tut HomeRun Adapter

BETA Though the Tut HomeRun Adapter is expected to reach shelves this fall, the final product wasn't available in time for testing; we evaluated a preproduction version. As with the Intelogis PassPort Plug-In Network, the HomeRun piggybacks a network signal over existing wiring—but in this case, over telephone lines. Similar to DSL (digital subscriber line), Tut Systems' technology uses a high-frequency signal that telephones can't detect, so the signal doesn't interfere with your phone's or fax's normal operation. Judging from what we experienced, the HomeRun is a good way to network devices without introducing additional wiring.



ON THE PHONE: *The Tut HomeRun operates over household phone lines without interfering with voice traffic.*

Unlike the PassPort, the HomeRun ($170 street) connects to the 10Base-T port on your PC. This means you also need to install a network interface card on each system and factor in the cost.

Though two versions of the HomeRun system—one external and one internal—are expected to reach store shelves by mid-September, we were only able to test the external model. The external HomeRun is a small black box with 10Base-T and phone connectors on the back and five status LEDs on the front. Setup was a simple matter of plugging the 10Base-T connector into the PC, then attaching the phone cord into the RJ-11 phone jack. A pass-through phone connector eliminates the need for phone-line splitters and keeps the wiring neat. The internal version ($150 street) is expected to combine the functionality of a standard Ethernet card and the external HomeRun Adapter on one PCI card.

Because HomeRun provides a standard 10Base-T connection, you can network virtually anything that uses Ethernet. We tested the HomeRun with a variety of desktop and notebook PCs, an Apple Macintosh, and an HP network printer, and the device performed flawlessly. The claimed throughput of 1 Mbps is fast enough for sharing access to printers, data, or 56-Kbps Internet access. In testing, the HomeRun's speed was fairly good.

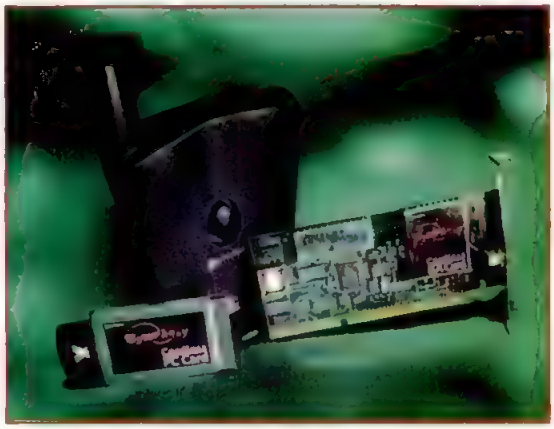
Tut states that the HomeRun can connect as many as 25 PCs and other devices up to a distance of 500 feet. To communicate, devices must be attached to one telephone connection. The package doesn't include any software, but most users will need only the built-in Windows Peer-to-Peer networking. The product has no modem-sharing capability.

The HomeRun has the makings of a capable alternative to traditional Ethernet. If you require 1-Mbps speeds and aren't comfortable with networking using RF signals, it's the only way to go. We look forward to testing the finished product.—*LF*

Tut HomeRun Adapter. Street price: $170. Tut Systems Inc., Pleasant Hill, CA; 800-998-4888, 925-682-6510; www.tutsys.com. *915 at www.pcmag.com/infolink.*

Proxim Symphony

BETA As with Tut Systems, Proxim was still putting the finishing touches on its SOHO networking product when we went to press; we evaluated a preproduction version. Developed from Proxim's RangeLAN product line, the RF-based Symphony system is made up of three elements: an ISA NIC ($149 list), a PC Card ($199 list), and an x2-compatible 56K modem ($299 list). The units we tested set up easily and performed well. The overall package promises to be an excellent RF-based solution.



READY FOR THE NET: *Proxim Symphony offers a wireless 56K modem to share an Internet connection over the network.*

Symphony uses the 2.4-GHz frequency to transmit data—thereby avoiding the interference problems the WebGear Aviator Wireless Network Kit exhibited in the 900-MHz range. To experience all the Symphony components in action, we set up a test network with two desktop PCs, one roving notebook, and the wireless modem.

The ISA NICs installed without a hitch; Microsoft Windows recognized them automatically upon rebooting the system. With the cards in place, we attached the antenna to the NIC with the included 6-inch cable. For best results, Proxim recommends placing the antenna in a high, clear spot; we found the top of the monitor to be perfect. The NIC cards worked on the first try.

Installation was similarly rote for the PC Card, but we found it suffers from some design problems we hope to see resolved in the shipping version. Though we liked the convenience of an attached antenna, it protrudes out of the PC Card slot by about an inch, making it easy to accidentally knock off when moving the laptop. Fortunately, the antenna appears to come loose before it snaps, and we found it easy to reattach. Second, reception is finicky and sensitive to the direction in which you point the antenna. When we pointed the notebook with PC Card away from the other units, we lost the radio signal on several occasions. Pointing it toward the units restored the signal, and the Card reestablished the network connection automatically. This likely occurred because the Card was preproduction hardware.

We found the x2-based cordless modem easy to set up; we simply connected it to a phone line and power outlet and placed it in a convenient location. The modem provides Internet access for any PC on the Symphony network (an excellent feature absent from most solutions we tested). In fact, the device actually operates as a router, connecting as necessary and automatically dropping the connection when not in use. Proxim states the modem will support the V.90 protocol when it's available.

Our first look at the Proxim Symphony showed its promise as a relatively inexpensive Ethernet alternative, with excellent shared Internet-access capabilities built in.—*LF*

Proxim Symphony. List price: Symphony ISA Card, $149; Symphony PC Card, $199; Symphony Cordless Modem, $299. Proxim Inc., Mountain View, CA; 800-229-1630, 650-960-1630; www.proxim.com. *917 at www.pcmag.com/infolink.* PC

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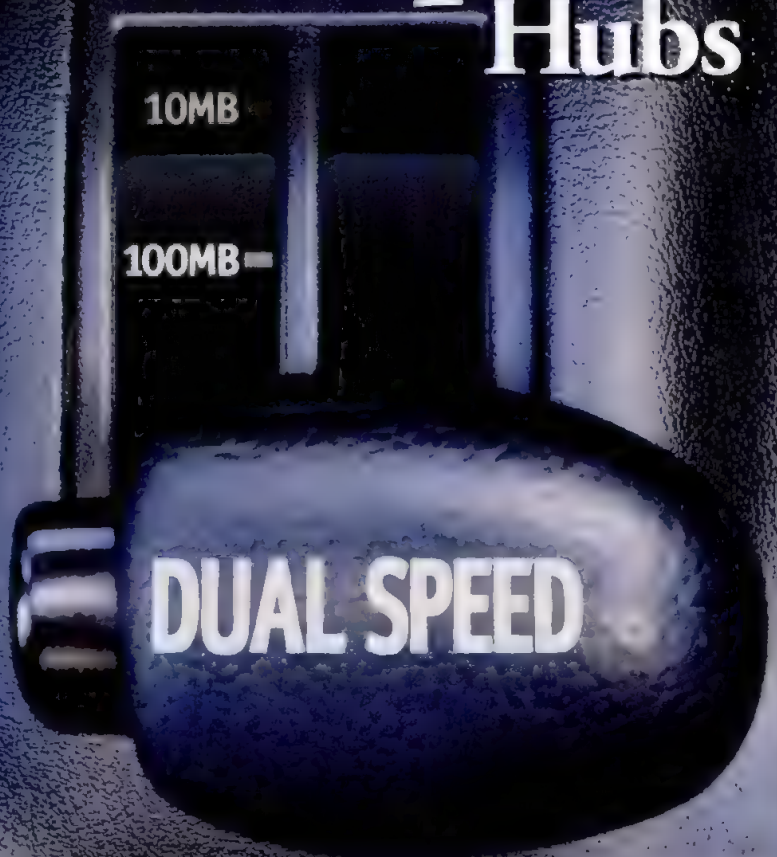

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Net Tools FROM THE BENCH

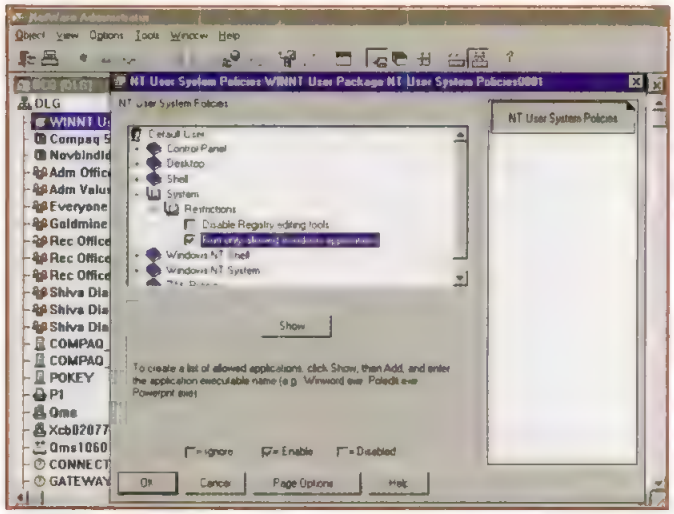
NETWORK MANAGEMENT

Zeroing in on Z.E.N.

By Steve Rigney

NetWare 4.*x* shops looking for relief from the management burden need look no further than Novell's Zero Effort Networks, or Z.E.N.works. This tool provides an economical way (at $39 list per client) to gather client data, control access to network resources, and distribute software—all from NetWare's administrator utility, NWAdmin.

Much of Z.E.N.Works' power comes from the capability it gives you to add PCs directly to the NetWare Directory Services (NDS) Tree and control them as you would any user or group.



AN OUNCE OF PREVENTION: *Novell WorkStation Manager eliminates potential problems by letting you control what your users can access.*

The program consists of three parts: Novell WorkStation Manager, Novell Application Launcher, and a remote-control application. Installation was fairly easy, with one caveat: You need to install NetWare Client32 on all your Windows 95 and Windows NT clients. A bundled utility helps to speed this process.

Novell WorkStation Manager lets you gather hardware data, distribute software, and provide access control by using NDS objects called Policy Packages. We created one that gathered configuration information each time a client logged on to the network. In a future release, we'd like to see the ability to export client configurations to a database for inventory purposes.

Like Microsoft's Zero Administration Windows (ZAW) initiative, WorkStation Manager's User System policies let you control the applications and commands a user or client can access. Even better, these policies travel with individual users. When you type your user ID and password into a system on the network, the program checks NetWare Directory Services (NDS) and applies your policies to that machine.

The Novell Application Launcher makes adding network printers a breeze. We selected the proper printer driver and assigned the printer to a set of users; when a user logged on, Z.E.N.Works established a printer connection and downloaded the driver to the client machine. Surprisingly, there is no integration with Novell's Distributed Print Services.

We found the remote-control utility handy for tasks from troubleshooting sick systems to checking client settings; it features the ability to run defined tasks on a scheduled basis.

Z.E.N.Works. List price: $39 per user. Requires: NetWare Client32 and NetWare 4.*x*. Novell Inc., Orem, UT; 800-453-1267, 801-222-6000; fax, 801-429-5291; www.novell.com. *918 at www.pcmag.com/infolink.*

ANALOG ROUTERS

ISDN Speeds, Dial-Up Prices

By Les Freed

If your office needs fast Internet access but the monthly costs of ISDN, xDSL, or cable modem services put you over budget, you'll appreciate two less expensive alternatives from Netopia and Ramp Networks.

Each of these companies has released a dual-analog router that lets you leverage multiple telephone lines to achieve a high-speed connection. These devices bond, or *aggregate,* multiple 56-Kbps analog connections into a single channel, using a method that resembles the way ISDN dynamically allocates bandwidth between its two B (*bearer*) channels.

Before buying an analog router, though, consult your ISP to see if your service supports accessing the same account from two different connections at the same time. Many don't.

The Netopia Internet Router with Dual Analog ($825 list) and the Ramp Networks WebRamp M3i Plus ($1,099 list) are each housed in a compact chassis that contains two K56flex modems (upgradable to the V.90 standard), an integrated 10Base-T Ethernet workgroup hub (eight RJ-45 ports for the Netopia, four ports for the WebRamp), a serial port, and a built-in remote-access server that can accept two incoming calls. These products also let you attach a third modem via serial port, which lets you further increase the unit's aggregated bandwidth or initiate three separate connections.

Though similar in many ways, the two products use different methods to provide fast connections. The Netopia employs a variant of the Point-to-Point Protocol (PPP) called Multilink PPP (MLPPP), which lets you bond multiple channels. (PPP supports only a single connection.) Not all ISPs currently support MLPPP, so make sure yours does. By contrast, the WebRamp uses a proprietary technology that speeds up performance by divvying up Web page elements and sending them separately over each connection, and it doesn't require MLPPP support from your ISP.

Although analog routers tout near-ISDN speeds, that's a bit of an exaggeration. The connections are bound by 56K technology limitations. From the outset, each 56K modem is limited to 53 Kbps by FCC restrictions. Even so, aggregated, they should be able to deliver upwards of 106 Kbps of throughput. But on our tests, the devices never exceeded 44 Kbps per modem or 88 Kbps aggregated. Moreover, if your company's telephone circuitry can't negotiate a 56-Kbps connection (because you use a PBX, for example), the modems will fall back to a 33.6-Kbps connection. (For details see "56K PC Card Modems," *PC Magazine,* August, 1998.)

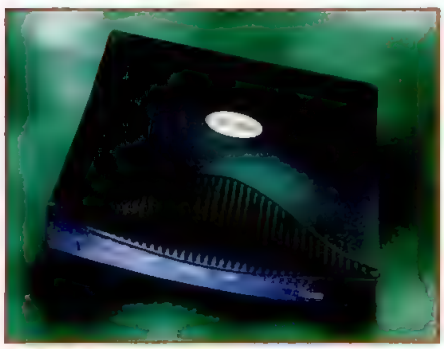
Finally, though these devices can dial and disconnect automatically just like ISDN, it takes them up to 20 seconds to do so, while ISDN takes under 1 second.

Net Tools

FROM THE BENCH

Netopia Internet Router with Dual Analog

If you need to connect your bandwidth-hungry small-office network to the Internet, you'll find the Netopia Internet Router with Dual Analog ($825 list) a flexible solution that is affordable, as well as easy to set up and manage. But if you need a secure link, opt for the WebRamp M3i Plus, which is comparable in many areas but includes VPN (virtual private network) capabilities.



DOUBLE-BARREL DIALING: *The Netopia bonds two 56-Kbps connections together.*

Like the WebRamp, the Netopia includes a minimalist guide, with detailed documentation available on its bundled CD-ROMs. Setup was easy using either of Netopia's configuration methods. Newer users will appreciate the nifty SmartStart wizard-based setup program, which led us through and even offered to provide an account with either Netcom or USA Internet, two national ISPs with MLPPP support (which Netopia requires).

More advanced users will probably prefer to configure the router using Netopia's excellent character-mode configuration interface. It provides a quick-start feature, as well as a rich set of diagnostic, logging, and monitoring tools. Though it's accessed through a telnet session or a terminal connection, we found the software relatively simple to navigate.

Like the WebRamp, the Netopia provides a remote-access server (RAS) as well as two Internet connections. The device can store as many as 16 user profiles; using the router for dialing in and out requires two separate profiles.

Both the Netopia and the WebRamp are rich in call-management features. They can each connect to two remote sites simultaneously (or three, if you attach an external modem to the serial port). They can answer an incoming RAS call on one line while simultaneously dialing to the Internet on another, and they will drop a line of a multiline connection when a user dials out using a phone or fax machine.

But only the Netopia can selectively answer incoming calls based on caller ID or distinctive-ring capability.

Netopia Internet Router with Dual Analog. List price: $825. Netopia Inc., Alameda, CA; 510-814-5000; fax, 510-814-5020; www.netopia.com. *920 at www.pcmag.com/infolink.*

Ramp Networks WebRamp M3i Plus

Though comparable to the Netopia Internet Router in most respects, the Ramp Networks WebRamp M3i Plus router ($1,099 list) has a few distinct pluses all its own. It is more expensive yet provides VPN capability (between two devices) and includes a Web server that lets you set up and configure the router via a browser. The product also uses Ramp Networks' proprietary technology to bond the analog channels. Though the company's Connection Optimized Link Technology (COLT) does not work using FTP, the router does not require that your ISP support MultiLink PPP.

Installation was a breeze, taking only 15 minutes. We simply pointed to the device's IP address and the WebRamp wizard walked us through the simple steps of entering our ISP phone number, account name, and password. We found the WebRamp's method similar to using Netopia's Windows-based SmartStart utility.

PRIVATE CONNECTIONS: *The Ramp Networks WebRamp M3i Plus supports a VPN between units.*

To bond the modem's analog channels, WebRamp uses COLT to parcel out Web page requests over both connections. COLT

SOFTWARE ALTERNATIVE

The More Modems, the Merrier

If you find the idea of aggregating modems for faster Internet access appealing but are squeezed by a tight budget, MidCore Software's MidPoint Gateway 3.0 ($299 list for five users) can help. This software solution sits on a nondedicated Windows 95, 98, or NT 4.0 Workstation desktop and lets you share up to eight modems of any variety—analog, ISDN, xDSL—and even cable and T1 lines.

Similar to dual-analog routers, MidPoint dials and disconnects on demand and aggregates bandwidth from different ISP connections to provide faster Web access. Running on Windows 95 or 98, it supports three simultaneous Internet connections; on Windows NT, it supports eight.

The application was easy to install and configure; we did so in only 10 minutes on a system loaded with an internal modem and an external ISDN terminal adapter. All of MidPoint's features and settings are controlled from one well-organized dialog box, which provides neat real-time activity-monitoring and troubleshooting tools.

Because our bandwidth demands were relatively low, we didn't see any performance hits on our processor. And you shouldn't see any either until you start combining multiple ISDN or cable modem connections.

MidPoint also operates as a Web page–caching proxy server similar to Ositis Software's WinProxy. You can configure the software to cache specific pages on a regular basis, as well as control content by using the Voluntary Content Rating (VCR) and Platform for Internet Content Selection (PICS) standards.—*LF*

MidPoint Gateway 3.0. List price: 5-user license, $299. Requires: Microsoft Windows 95, 98, or NT 4.0 Workstation. MidCore Software Inc., Middlebury, CT; 203-577-5370; www.midcore.com. *924 at www.pcmag.com/infolink.*

Information released.

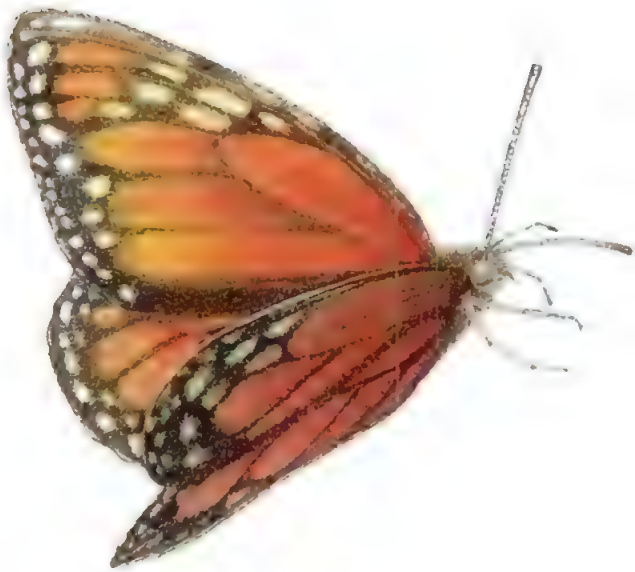
E-mail sent.

File transferred.

Database updated.

Task accomplished.

Deadline met.



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ProSignia 200 Series

Compaq ProSignia 200 is specifically optimized for network productivity and designed for network operating systems, such as Novell IntranetWare for Small Business and Windows NT. ProSignia 200 also provides more room for expansion and includes management tools and features that ensure data integrity, reliability and security for a networked environment. And it delivers all of these features for the price of a desktop computer.

ProSignia 200 Series

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300MHz Pentium II	32MB	4.3GB	SCSI	16X Max	10/100	$2189.70	107800

Compaq RAM upgrades

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32MB EDO RAM kit CDW 73194

64MB EDO RAM kit CDW 7319[illegible]

ProSignia 200 Small Business Server

◆ 300MHz Pentium II processor ◆ 64MB EDO RAM standard, expandable to 192MB ◆ 4.3GB Ultra SCSI hard drive ◆ 16X IDE CD-ROM drive ◆ 10/100 Ethernet controller ◆ 56K bps data/fax modem ◆ 4/8GB internal SLR tape drive ◆ Microsoft Small Business Server with 10 client licenses

$4638.45 CDW 107801

*Monthly lease payments quoted are based on a 36 month lease. Rates are subject to change. Call your CDW account manager for details.

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Fast EtherLink XL and EtherLink XL

3C905B and 3C905B-NM cards

◆ One of the industry's best performing 10/100 Fast Etherlink XL Network interface cards ◆ Includes 3Com's latest technology, Parallel Tasking II, which improves the speed that data is passed from the NIC to the PC ◆ 3C905B supports Remote Wake Up allowing remote power-up ◆ Superior Intelligence includes DynamicAccess software featuring Traffic Prioritization, dRMON and Fast IP ◆ Lifetime warranty

3C905B	$88.74	CDW 107715
3C905B, 5-pack	$397.98	CDW 107718
3C905B, 20-pack	$1527.88	CDW 107717
3C905B-NM	$89.77	CDW 107719
3C905B-NM, 5-pack	$417.02	CDW 107722

More information on 3Com products is just a few clicks away at 3com.cdw.com

OfficeConnect

3Com's OfficeConnect™ product line makes it simple for small offices to improve productivity by networking their computer resources. A choice of OfficeConnect hubs provides central connections for up to sixteen computers.

Hub8/TPO 8 RJ-45 ports	$78.49	CDW 66411
Hub TP400 4-port Fast Ethernet hub	$139.57	CDW 100896
Hub TP800 8-port Fast Ethernet hub	$278.43	CDW 100895
Hub TP1200 12-port Fast Ethernet hub	$357.54	CDW 100894

SuperStack II Dual Speed Hub 500

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12-port	$716.18	CDW 106557
24-port	$1034.33	CDW 106558

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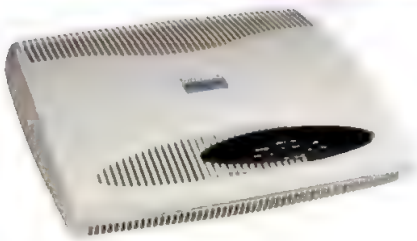


CISCO SYSTEMS

1600 Series routers

Cisco 1600 Series routers connect small offices with Ethernet LANs to the Internet and company intranets using several wide-area-network technologies: ISDN, asynchronous serial modems, and synchronous serial such as Frame Relay, leased-lines, Switched 56, SMDS and X.25. Each Cisco 1600 has an Ethernet port, a built-in WAN port and a slot for a feature pack.

1601 $1119.72 CDW 85693
✦ Ethernet/serial router ✦ Requires Feature Pack

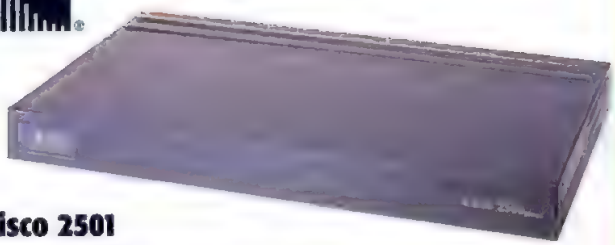
1602 $1269.67 CDW 88859
✦ Ethernet/serial router ✦ Requires Feature Pack

1604 $1277.28 CDW 86882
✦ Ethernet/ISDN router with NT-1 ✦ Requires Feature Pack

CON-SNT-PKG2
SmartNet for 1600 Series routers $129.68 CDW 93252

IP SW Feature Pack $12.38 CDW 88696

IP/IPX/AppleTalk software Feature Pack $159.20 CDW 90231



Cisco 2501

Single LAN/dual WAN router

The Cisco 2500 Series single LAN/dual WAN routers combine local-area network (LAN) routing capability with two synchronous wide-area network (WAN) options. This means one serial port can be used for a Frame Relay connection, the second serial port for a legacy device, such as a cluster controller. The optional integrated services digital network basic rate interface (ISDN BRI) port can be used for bandwidth-on-demand, or disaster recovery. The Cisco 2501 includes one Ethernet LAN connection with two Sync Serial WAN connections.

$1699.53 CDW 86418

IP Feature Pack $13.61 CDW 86419

IP Plus Feature Pack $529.50 CDW 93785

Microsoft

1996 Winner MVP PCComputing

BackOffice Server V4.0

Microsoft BackOffice V4.0 is one of the only comprehensive and integrated suites of server applications designed for your corporate network, intranet and the Internet. Built on Windows NT Server, it includes seven best-of-breed server products in one integrated information system. BackOffice V4.0 gives you more choices at a lower cost for working on your company's corporate network and intranet, as well as on the Internet.

Includes: Microsoft NT® Server V4.0, Windows NT Server V4.0 Option Pack (including Internet Information Server V4.0, Microsoft Transaction Server and Microsoft Message Queue Server), FrontPage 98, SQL Server V6.5, Exchange Server V5.5, Site Server V2.0, SNA Server V4.0, Systems Management Server V1.2, Proxy Server V2.0, integrated setup and administration, and intranet starter kit.

Full version $2229.26 CDW 103492

Version upgrade, CD $787.73 CDW 103493

Competitive upgrade, CD $1825.37 CDW 103494

5-client access licenses $1169.16 CDW 103495

20-client access licenses $3699.46 CDW 103496

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IBM Netfinity 3500 Series

CPU	RAM	Hard drive	CD-ROM	Price	CDW
233MHz Pentium II	32MB ECC	OPEN	24X	$1978.58	106991
266MHz Pentium II	64MB ECC	OPEN	24X	$2298.55	106993
266MHz Pentium II	64MB ECC	4.3GB	24X	$2768.25	106994
333MHz Pentium II	64MB ECC	OPEN	24X	$2798.22	106996

RAM upgrades

32MB ECC SDRAM	$128.72	CDW 104492
64MB ECC SDRAM	$284.48	CDW 103863
128MB ECC SDRAM	$556.30	CDW 100929

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CROSS TALK

ISDN versus dual 56-Kbps connections? Toni, it's about cost and simplicity. ISDN might be faster than dual-analog lines, but it costs more to keep up—not to mention the hassle of getting it installed. Most people will fare better getting a second telephone line and a dual-analog router.

Frank, these aren't products you buy willy-nilly. You have to research your local ISPs to make sure that they support the required line-bonding protocols or at least let you share the same account over multiple connections simultaneously. Many ISPs I know provide neither.

exploits the fact that most Web pages are composed of separate elements. When a browser requests a Web page, the WebRamp opens a separate TCP/IP connection for each element. By spreading these requests evenly between its two connections, it achieves speeds equivalent to that of two MLPPP bonded channels.

One shortcoming of COLT is that it doesn't work with FTP files. Unlike Web page requests, FTP file requests open only a single connection that cannot be split up between the two channels. However, COLT does not require your ISP to support any additional protocols. Ramp Networks has made a V.90 modem upgrade available and is expected to have an MLPPP update also available by the time you read this.

For those who don't require remote capabilities or a VPN, Ramp Networks also offers a scaled-down version, the WebRamp M3i, for $799 (list).

Ramp Networks WebRamp M3i Plus. List price: $1,099. **WebRamp M3i.** List price: $799. Ramp Networks Inc., Santa Clara, CA; 408-988-5353; www.rampnet.com. *921 at www.pcmag.com/infolink.*

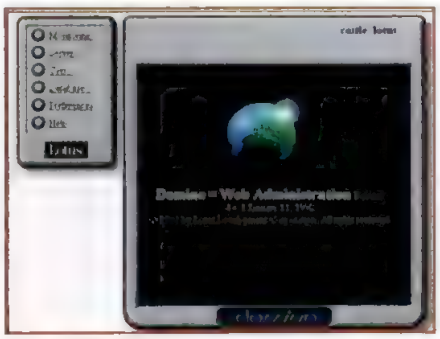
INTRANET AUTHORING TOOLS

Your First Intranet

By Michael Bender

Creating a corporate intranet that's easy to use is within reach with Lotus Development Corp.'s Domino Intranet Starter Pack, Release 2.0 ($1,700 street). This software solution offers a number of groupware capabilities, including e-mail, phone book, and threaded discussion, as well as simple document posting for FAQs, job postings, and other corporate content. The product also has Domino Server and a five-user license for Lotus Notes or Web browser clients.

Installing Domino on our server, a 300-MHz Pentium machine with 64MB of RAM running Windows NT 4.0 and Service Pack 3, was fairly straightforward—except for one snag. When we started the server, it should have brought up Site Creator, which guides you through setup. But neither we nor the Lotus tech support could get this to work. Following Lotus's suggestion, we accessed it successfully via a Notes client instead.



EASY ISN'T BORING: *Domino Intranet Starter Pack provides aesthetically pleasing templates.*

Site Creator presented us with 12 templates with which to design our intranet. After we made our selections, the product began to create the site. The manual states that this process should take only about 15 minutes, but our site took nearly 45 minutes. We suggest using a stouter system, at least a dual Pentium system with 256MB of RAM.

The resultant Web site was aesthetically pleasing and intuitive to navigate. By logging on at the intranet home page, we gained access to a contact manager, customer- and project-tracking program, and employee phone book.

We liked Domino's simple-to-publish features and elaborate document-approval system, which ensures that only approved content gets posted. You can also assign users read, write, or design rights to all or part of your site.

Though we appreciated Lotus's attention to ease of use and management, we wished the Starter Pack let us incorporate APIs and CGI scripts into our intranet natively. To get these features, you'll need to invest in Notes Designer for Domino ($500 street).

Domino Intranet Starter Pack, Release 2.0. Street price: $1,700. Requires: 133-MHz Pentium processor or better, 64MB RAM, 1GB hard disk space, Microsoft Windows NT 4.0. Lotus Development Corp., Cambridge, MA; 800-346-1305, 617-577-8500; fax, 617-693-0968; www.lotus.com. *923 at www.pcmag.com/infolink.*

MOBILE MANAGEMENT

Locking Down Roving Users

By Steve Rigney

Keeping road warriors from futzing with their notebooks has always been a problem. If they got into trouble by deleting a critical DLL or messing with the Registry, there wasn't much you could do until they returned to the office. But Mobile Automation's RightState 2.0 ($175 list per mobile system) protects your mobile users from themselves—by giving you the power to revert their configurations to a prior state. It also lets you configure, manage, install, and update software.

RightState runs on Windows 95 and Windows NT; server software resides on network, and a mobile agent sits on the notebook. The server communicates with an agent via an e-mail connection and works with most POP3 and SMTP mail packages, as well as some IMAP4 products.

Installing the server portion went off without a hitch. But while installing the agent on our notebook, we encountered a problem using cc:Mail 6.1 that caused the product to run only intermittently. Though the vendor claims the problem was with our PC, we had the same trouble after installing it on other notebooks.

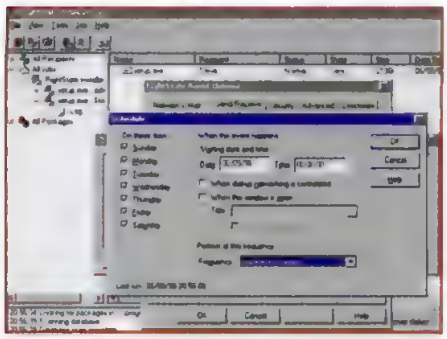
The agent continuously compares the notebook's configuration with a configuration profile on the server that you create. If the agent discovers altered system settings or the presence of unauthorized software, it sends you an alert when the user initiates an e-mail session. Then you transmit an instruction package to the notebook that returns the system to its proper state.

Creating these packages takes some doing, because you need to script every action you want the agent to perform. Though it took several hours to master the scripting, we're impressed with this approach's power and flexibility.

RightState economizes bandwidth by sending only the necessary changes across the wire. More-

over, it takes large packages, which can be several megabytes in size, and converts them into a series of smaller packages that are sent across the wire (one per e-mail session). When the agent receives all the packages, it reassembles and then executes the instructions.

RightState 2.0. List price: $175 per remote user. Server requires: 486 processor or better, 16MB RAM, and 10MB disk space. Client requires: Microsoft Windows 95 or NT, 486 or better PC, 8MB RAM, and 4MB disk space. Mobile Automation, Los Angeles; 800-344-1160, 310-914-9603; www.mobileautomation.com. *922 at www.pcmag.com/infolink.*



SEMPER FI: *RightState always checks that your remote system is faithful to its configuration.*

CD-ROM SERVERS

Image Is Everything

By Craig Ellison

CD-ROMs are typically served up to network users by way of CD-ROM drive—populated towers. But the Microtest DiscportVT CD-ROM server ($2,495 list) provides a more efficient and scalable method by caching a CD-ROM's content, or *image*, on to its hard disk. Users simply access the server as they would any mapped network drive.

Microtest designed the shoe box–size DiscportVT to simulate a 14-bay tower; you can store up to 100 CD-ROM images on it. The server also provides easy installation, Web-based management, and hassle-free maintenance. Moreover, Microtest includes Launch Pro, a program that adds license metering and queuing, application usage statistics, and FastCD application-launching capabilities.

The server chassis houses a 133-MHz AMD 586 processor, an 8GB hard disk, a 10/100 Ethernet port, and a SCSI connection. Microtest offers a lower-end version ($1,995 list) with a 4GB hard disk emulating a seven-bay server which holds up to 100 images.

For added scalability and flexibility, there also is a SCSI port, which let us attach up to seven SCSI hard disks, CD-ROMs, and DVD drives. After we connected a SCSI hard disk, the server automatically recognized the disk, installed a partition, and readied it to store additional images.

The device lets you create CD-ROM images two ways. You can connect a CD-ROM drive to the server, which then automatically creates an image of any resident CD-ROM. Or you can use the Easy Image utility, which lets you copy CD-ROMs from a Windows NT Workstation or Windows 95/98 desktop. Though transferring several megabytes of CD-ROM data over the network during the day might not be a good idea, a scheduler can transmit the data during off-peak hours.

Adding new users is simple: When a new user initially logs on, the server searches NetWare's Bindery or Windows Domain Server for that user's information, then adds it to the DiscportVT's access list. You can assign rights to users or groups for each image on the server, and Microtest promises to add NDS support via a free flash upgrade in the future.

SMALL BUT MIGHTY: *The DiscportVT emulates a 14-bay CD-ROM tower.*

Microtest DiscportVT. List price: $2,495. Microtest Inc., Phoenix; 800-526-9675, 602-952-6400; fax, 602-952-6401; www.microtest.com. *919 at www.pcmag.com/infolink.*

SERVER SUITES

The New Suite in Town

By Steve Rigney

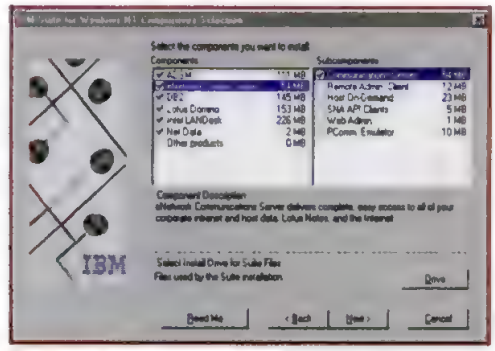
Finally, there's an answer to Microsoft's Back Office suite of server applications. IBM Suite for Windows NT 1.0 provides an excellent alternative that matches Back Office component for component. The biggest difference between the two is in management integration: While Back Office lets you manage and monitor all the applications from a single console and provides APIs that developers can write to, IBM's suite provides only a common installation of its applications. The company plans to tighten integration in future releases.

Both suites set their sights on branch offices and departments with 2 to 200 users and offer messaging, Web hosting, software distribution, and database, backup, and SNA connectivity. IBM plans to release enterprise and small-business versions shortly as well.

Installing the IBM Suites was easy, taking seven CD-ROM disks about 30 minutes on a Gateway NS-7000 with dual Pentium 233-MHz processors and 128MB of RAM.

The suites share similar pricing and server requirements. Although both server licenses cost $2,499 (list), IBM's single client costs $255 (list)—a comparatively better price than that of Microsoft's five-user license, available for $1,309 (list). Each offers substantial savings over purchasing the components a la carte; on server licenses, you'll save 46 percent with IBM Suite and 74 percent with Back Office.

To determine which suite fits your company best, consider the applications you're running or want to run now or plan to run down the road. IBM shops that already use Lotus Domino or DB2 are good candidates for IBM Suite for Windows NT, which includes both applications as well as Intel LANDesk Management Suite, eNetwork Communication Server 5.0, and ADStar Distributed Management System (ADSM) 3.1.



NEW SUITE ON THE BLOCK: *The IBM Suite provides easy installation of the vendor's applications.*

Also, if you're running or plan to run multiple platforms, it's important to note that unlike Back Office, IBM Suite is not wedded to Windows NT.

IBM Suite for Windows NT 1.0. List price: $2,499 per server license; $255 per client. Requires: Pentium-based PC or better, 64MB RAM, 600MB hard disk space, Microsoft Windows NT Server 4.0 with Service Pack 3.0. IBM Corp., Armonk, NY; 800-426-3333, 914-765-1900; www.ibm.com. *925 at www.pcmag.com/infolink.* PC

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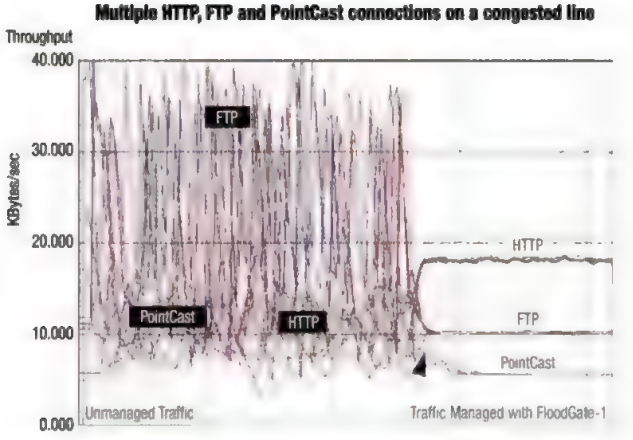
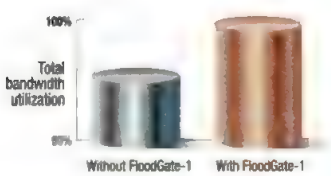


Without traffic management, applications fight for limited bandwidth and waste expensive capacity. With FloodGate-1, you can prioritize network traffic to guarantee critical application delivery and maximize bandwidth investment.

New FloodGate-1™ ensures your company's business applications get the bandwidth they need to bring in profit. By eliminating network congestion. By letting you assign higher priorities to the most critical applications, services and users. By getting the most from the bandwidth you already have, so you don't have to invest in more than you need.



Maximum bandwidth means maximum profit. With FloodGate-1, you maximize the availability and reliability of your network, which means you don't have to invest in excess capacity. More importantly, you can guarantee that mission-critical applications get the bandwidth they need when they need it, so your company always runs at maximum profitability.

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Get proof. Get the free Check Point white paper. We know improved profit may sound too good to be true. That's why we've posted an enterprise traffic management white paper at our web site. Download it. Read it. And see how FloodGate-1 helps get your network ready for business.

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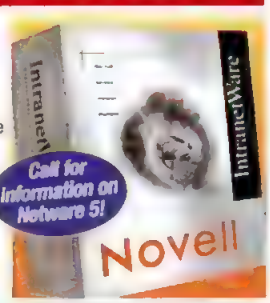

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DEC3374	3Com Etherlink XL 10BT PCI UTP	$54.99

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DEH1647	Netgear 8 Port 10BT Hub Internal Power	$89.95
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DEH2140	HP AdvanceStack 24 Port Segmentable Hub	$819.95

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DEH3225	3Com Office Connect Hub TP800	$279.99
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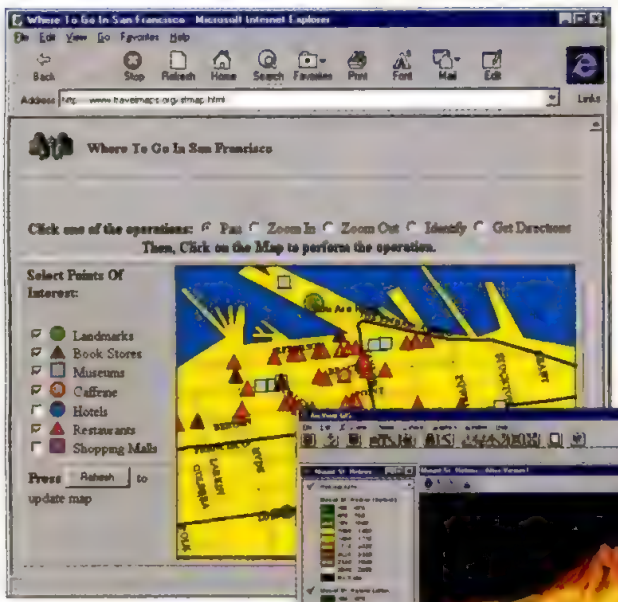

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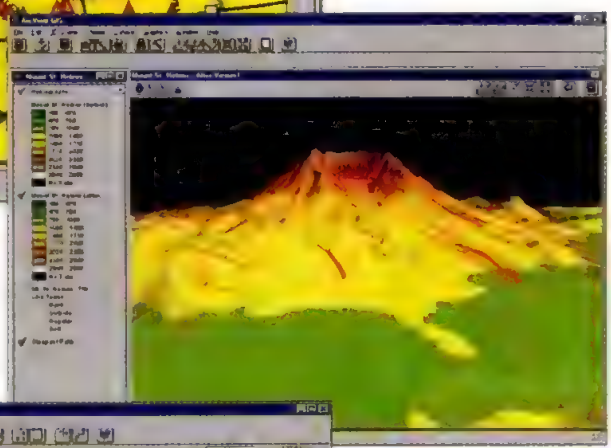

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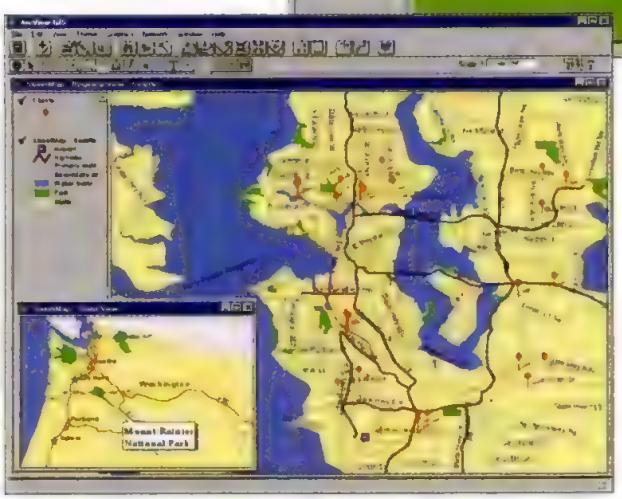

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PC Tech

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Web Application Servers

Application servers help enable the development and deployment of increasingly complex Web applications.

By John Garris

The requirements for Web site development have grown considerably more complex over the past few years. Where at one time Web site development meant no more than creating HTML files and simple CGI scripts, today the Web has become the preferred user interface to handle a host of new application types. As a result, Web developers have to deal with many of the same requirements and problems associated with traditional applications development.

Many of the problems that current Web sites face have nothing to do with development, but rather with deployment. The challenge of building Web sites with reliability, scalability, stability, and manageability is just now being addressed. As Web sites begin to handle more business-critical applications, the systems management and operational issues associated with Web development become crucial.

A new model for Web development has evolved to address these development and deployment issues. *Web application servers* have been popularized by products such as Netscape Application Server (formerly Kiva Server) 2.1 and NetDynamics 4.0. They are called application servers because they form a clear level of separation between the Web server and data access layers. As the diagram "The Application Server Model" shows, Web sites built using the application server model consist of at least three back-end layers: the Web server layer, the application server layer, and the data layer. In this model, most or all application logic exists in the middle tier, with application servers handling all data manipulation and HTML page-creation functions.

For small workgroup applications, Web scripting solutions such as Microsoft's Active Server Pages (ASP) and Netscape's server-side JavaScript may be less costly and easier to implement.

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INSIDE

INTERNET TECH: Is your correspondence safe from prying eyes? The S/MIME specification promises secure electronic communications regardless of platform or e-mail client. We explain the technology behind the standard, the way the pieces are supposed to fit together to provide a secure system, and the reasons why it doesn't always work. *Page 263.*

UTILITIES: Long filenames were just the beginning. Our popular Explorer Notes utility allows you to associate a note of up to 255 characters with any file or folder. The latest version adds new functionality, and it's compatible with Microsoft Internet Explorer 4, Windows 98, and Windows NT 4. *Page 269.*

PC SOLUTIONS: Opening a command prompt and printing directory listings from the right-click menu; quick tips to speed up a sluggish system; deleting GID files to save hard disk space; changing asterisks to spaces in Excel; distributing Access reports; and more. *Page 285.*

But the application server approach offers a number of inherent advantages, particularly for applications that over time will grow in complexity of business logic or in number of users. In particular, the application server approach offers these advantages:

Sophisticated application development environments. Although they are quite different, both NetDynamics and Netscape Application Builder (NAB), the development component of NAS, provide development environments specifically designed for Web applications.

Scalable deployment architectures. Both products provide ways to deploy applications in scalable fashion to accommodate increasing user demands over time.

Integration with legacy data sources. Many Web applications need to interface with existing business systems, whether they be financial systems based on SAP R/3 or PeopleSoft or TP monitors, such as BEA Tuxedo. Both products are able to integrate with such applications in ways that leverage the key advantages of their application server architectures.

In this article we won't evaluate these products with the idea of choosing the better one. Rather, we will explore the approach each takes toward the issues noted above.

THE DEVELOPMENT ENVIRONMENT

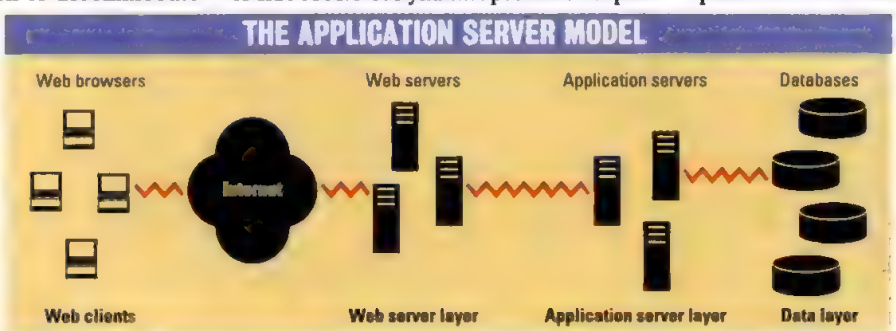
Development in an application server environment is not like traditional CGI scripting. Building large-scale Web applications typically involves two sets of developers, one dealing with HTML coding and user interface issues and another handling the processing of business logic. HTML coders are free to use their favorite Web authoring tools to design the pages, and Java or C++ programmers use the development tools provided with the application server to create the application.

The development environments provided by NetDynamics and NAB enable such separation by using a template-based approach. Both products embed special tags within standard HTML files that alert the application server to insert dynamically generated data coming from server-side code or a database query. After the development tools create generic HTML files with special tags, HTML coders modify those files to build the Web user interface. Applications developers build the business logic using a suite of graphical tools and an object framework that comes with the product.

DEVELOPING WITH NETDYNAMICS STUDIO

Of the two products, NetDynamics builds a lot more functionality into its development environment. Although both products let you do many of the same things, the NetDynamics tools automate the development process better and let you develop applications more quickly.

To a developer, a NetDynamics Web application is essentially a combination of HTML templates and Java objects that execute server-side code. NetDynamics provides a sophisticated Java-based object framework in which most generic application components—such as Web pages, data sources, SQL operations, user session information, and security—are all represented as Java objects.



The key to developing NetDynamics applications is understanding the object framework and the underlying event model that defines the sequence of events executed in generating a Web page. After the initial learning curve, you spend a lot of your time doing one of two things: running wizards to create instances of Java objects (see Figure 1) or overriding event handlers to insert application-specific functionality. For example, you might write code in an event handler called `btnSubmit_onWebEvent` to be called whenever a user clicks on a *Submit* button on a Web page. Or you may override an `onBeforeExecuteEvent` event to write to a log file before you execute code that updates a database table.

NetDynamics Studio, an integrated environment where you build and debug your applications, makes development a lot easier. Its wizards and graphical tools do a good job of building complex objects, such as data sources (reusable connections to a database) and data objects (which generate SQL calls to your data sources). With the Data Object Editor, for example, you pick your tables and columns and specify join criteria and any other SQL clauses, and the program builds the SQL statement. You can also preview your data results directly from within the editor.

To create dynamically generated Web pages, you use the Page Wizard, with which you bind a data object to the page and specify how you want results to appear. From there, the Page Wizard builds the Java object and generates an HTML template with NetDynamics tags. You can then customize the HTML files using any authoring tool.

Studio lets you build client-side Java applets in addition to HTML pages, but most people won't use them. The advantage to building Java applets is that you can build extra functionality into a Java client; for example, users can scroll through result records without making separate HTTP requests for each results page. The problem with the Java approach is that it usually requires downloading the over 1MB of client-side Java software. This extra download makes the deployment impractical for many environments.

DEVELOPING WITH NAB

Where NetDynamics has a lot of sophistication built in, the NAS approach is much more bare-bones. The tools bundled with Netscape Application Builder (NAB) 2.1—the AppLogic Designer, the HTML Designer, and the Query Designer—don't provide the level of automation that NetDynamics offers.

Where NetDynamics provides an object framework with a defined set of event handlers, NAB applications are built around a set of server-side code modules called *AppLogics*. Each AppLogic object contains an execute method, which you override to perform the main task for that AppLogic. You will typically write a series of AppLogics to handle each of the major components of your Web site; for example, for a human resources application you might create AppLogics for your log-on page, your benefits summary page, and your various detail pages.

AppLogics can be written in either Java or C++; NAS provides class libraries and runtime environments to support both languages. The NAB Server Foundation Library is a set of public classes and interfaces that developers can use to build database transactions, format SQL query results, manage user sessions, and authenticate users within their AppLogics.

The NAB AppLogic Designer is essentially a Java-based wizard that helps you build a number of AppLogic types, such as a log-on page or an HTML report populated with SQL

query results. You would use the AppLogic Designer in conjunction with the HTML Designer and the Query Designer to generate SQL statements that access data sources and format the results within a Web page. The HTML Designer is a no-frills editor for creating basic HTML pages with embedded NAB tags. Typically, you would use a third-party authoring tool to augment the presentation of your HTML pages.

The Query Designer is more powerful. It lets you visually build your data model, which consists of all your database tables and the relationships between them. You then build any number of queries based on the data model you've created.

One of the trickiest issues is managing user session information.

DATABASE ISSUES

Both NetDynamics and NAB have mechanisms to help improve performance in accessing databases. For example, you can cache result sets so that when the application server sees a SQL query with input parameters that match a previous query, it will respond with cached values instead of reexecuting the SQL statement. Although data caching isn't appropriate for all query types, in many cases it can provide noticeable performance benefits. If the data in your SQL query rarely changes but is frequently accessed, it's probably a good target for data caching.

NetDynamics also does a good job of maintaining pools of database connections. Using NetDynamics Studio, you can configure a set of persistent database connections and make them available to all your Web users. If you need to preserve multiple database permission levels, you can map particular Web users to specific database users from within Studio. The NAS Administration Tool also lets you cache database connections for faster performance, but the development tools don't automate the process of mapping Web users to database login IDs.

TRACKING USER STATE

One of the trickiest issues in building Web applications is managing user session information. Because of the stateless nature of HTTP, tracking individual users throughout the course of an application is difficult, and yet it is essential for things such as site authentication and maintaining shopping-cart information. Traditionally session state is handled at the most basic level through use of an identifier, usually an HTTP cookie or HTML hidden field, that lets an application map a particular Web request to a specific user. Developers map that identifier to a set of application-specific data, usually stored in a database.

Both NetDynamics and NAB make it easier to store and retrieve session data without requiring developers to access cookie or hidden-field information manually. Both products let you store and retrieve information about individual users programmatically by referencing special objects that contain data about that user. These mechanisms make it a lot easier to track users as they navigate through the various pages in the application. Furthermore, both products manage the process of accessing session information in a distributed (multiple-server) environment, a process that would be difficult in a homegrown environment.

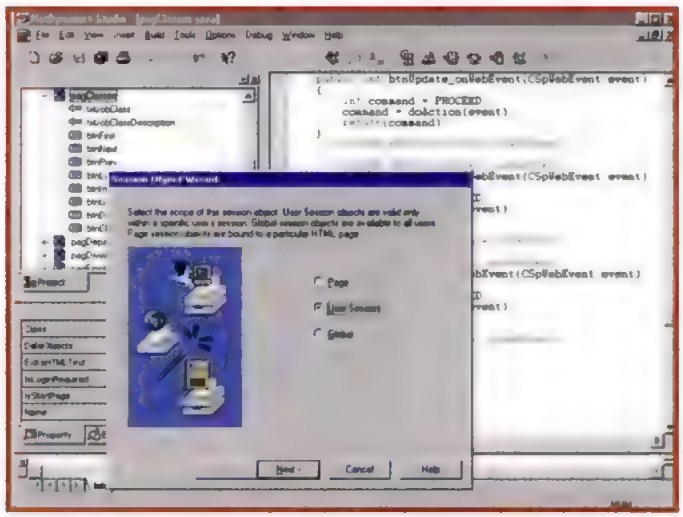


FIGURE 1: *NetDynamics Studio provides many tools and wizards to automate the development process.*

MANAGING LARGE-SCALE DEPLOYMENT

Application servers are more than just development platforms. In fact, the reason application servers occupy a separate position in the Web development space is that they provide server architectures suitable for large-scale deployment.

What exactly does that mean? Let's say you build a Web application using a standard development tool like Borland's JBuilder. You write many lines of Java code to handle your application logic, and you deploy it on a single server to serve 100 users. Your department manager loves the final product so much he decides to put 1,000 more users on the same application. What happens now? Your Java code that runs beautifully for 100 users may hit performance bottlenecks at such a higher load, and since your application wasn't designed to work within a distributed computing environment, you run into problems of scalability.

Application servers, to a large extent, separate the process of Web development from Web deployment, so that systems administrators (and not developers) deal with capacity-management issues. They provide application load balancing, fault tolerance, and system-monitoring capabilities you won't find in most homegrown applications or workgroup Web products, such as Active Server Pages.

LOAD BALANCING AND FAULT TOLERANCE

The basic premise behind load balancing is that you deploy copies of all your application code on any number of application servers and have the Web server distribute requests to each application server in such a way as to distribute the load evenly among all the servers you deploy. If you need more server power, you add another server.

One reason load balancing is important in Web applications is the increasing popularity of server-side Java. There are many advantages to writing in Java, but raw performance is not one of them. Despite the performance improvements with just-in-time compilation and other optimization methods, Java execution remains slower than C and C++ and will continue to be slower for some time. Furthermore, one of the problems with Java's portability is that performance on an unoptimized Java virtual machine (JVM) platform may be many times slower than on a tuned platform such as Windows NT or Solaris. So load balancing can considerably improve performance problems by providing scalability though additional hardware.

Although load balancing sounds simple in

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theory, several concerns complicate the issue. What, for example, happens to the session information we described above? Suppose a user on an electronic storefront application adds an item to his shopping cart, and that request is handled by server A. The user then wants to purchase all the items in his shopping cart. This request goes to server B, but server B doesn't have a copy of the user's session data. Obviously, a method to ensure consistency of data must exist, so the server can still process the request.

Equally important is the load-balancing algorithm itself. When a Web server gets a request, how does it know which application server should handle it? The Web server could use a simple round-robin scheme, but that may not be the most efficient way to distribute load. For example, some code fragments may be more resource-intensive or more mission-critical than others, so you may have more powerful servers dedicated to handle those tasks. Or you may have multiple server types deployed, and you may want to send more requests to the more powerful servers.

Another significant issue related to load balancing is fault tolerance. Although hardware solutions such as RAID and high-availability servers (such as Sun Enterprise Cluster HA or Vinca Co-StandbyServer) provide fault-detection and recovery capabilities, application servers provide some reliability features as well. At the single-server level, you can configure multiple server processes to serve users in case one server process goes down, and you can have the server attempt to restart failed processes automatically. At the multiple-server level, you can have other servers within the server cluster take over responsibilities when one server goes down. The issue here is determining where in your deployment environment single points of failure may occur and building increased fault-tolerance around those areas.

Let's take a look at how each product tackles the above issues.

The NAS deployment environment essentially consists of four servers: Kiva Executive Server (KXS), Kiva Java Server (KJS), Kiva C++ Server (KCS), and Kiva Administrative Server (KAS). Of these, KXS contains the main application engine and is responsible for distributing requests to a KJS or KCS process for code execution. KJS and KCS are the execution environments for the Java or C++ AppLogic modules. KAS provides administrative functions and controls all server configuration settings for all NAS servers.

There are several ways to deploy NAS applications in a multiserver environment. You can *partition* NAS applications by distributing AppLogic modules among the various servers. For example, if you were building an online brokerage site, you could put all your trading modules on one set of servers and put less critical modules on your other servers. Or you could choose to load-balance your applications by putting copies of all AppLogic modules on all servers. A typical deployment includes both partitioning and load-balancing scenarios.

In a load-balanced environment, NAS uses a sophisticated algorithm to determine the best way to distribute the load across available servers. At administrator-specified intervals, each server generates an overall performance value and broadcasts that information to all the other servers. This performance value is based on a number of settings, including system load (CPU, I/O, and memory), requests per second, average execution time, and result caching, and each setting is user-configurable in terms of percentage of total rating (see Figure 2). You can also specify how often each server calculates values internally and how often results are broadcast to other servers. Each server uses these ratings to determine which server is best able to handle the next incoming request.

NAS 2.1 has a new feature that installs a load-balancing plug-in on the Web server, so that the Web server can send requests directly to the least-used server. With previous versions, the Web server always sent requests to a specific NAS server; that server would then forward requests to other servers based on its internal load calculations. Although NAS servers can still forward requests if another server is less used, the new feature more effectively distributes load and eliminates a potential single point of application failure.

NAS synchronizes user session information among servers by designating one server as the primary data store. Servers are defined in one of three ways: the primary server, which always receives all session data updates; hot-backups, which receive exact copies of primary server data and become live if the primary server fails; and secondary servers, which synchronize data in their local stores with the primary data store at specified intervals. The hot-backup provision is useful because it lessens the possibility of application downtime in the event of primary server failure.

Since session data isn't updated in real time to all servers, there may still be problems with data consistency. To deal with that, NAS provides a feature called *sticky load balancing*, where all requests within a given session always go to the same server regardless of load statistics. If session data is continually being updated, sticky load balancing is the best way to ensure proper application functionality.

NAS provides fairly solid fault-tolerance capabilities. Its load balancing provides one level of fault tolerance, since other servers can step in if one server goes down. Moreover, within a single server you can configure multiple KJS or KCS processes to run simultaneously. If your code brings down one KJS process—which will probably happen more often than you think—other KJS processes will still keep the server running. You can also have NAS attempt to restart the KJS or KCS processes automatically.

NetDynamics doesn't provide NAS's granularity in tuning load-balancing algorithms. And compared with NAS, NetDynamics requires more manual configuration in deploying applications and is less intuitive. Despite those limitations, NetDynamics does offer a lot of flexibility.

NetDynamics uses the terms *cells* and *partitions* to define the way applications are deployed. A cell is an entire deployment of a NetDynamics application and can reside on a single machine or on multiple machines. A partition is essentially one machine within a NetDynamics cell; it consists of a set of NetDynamics services

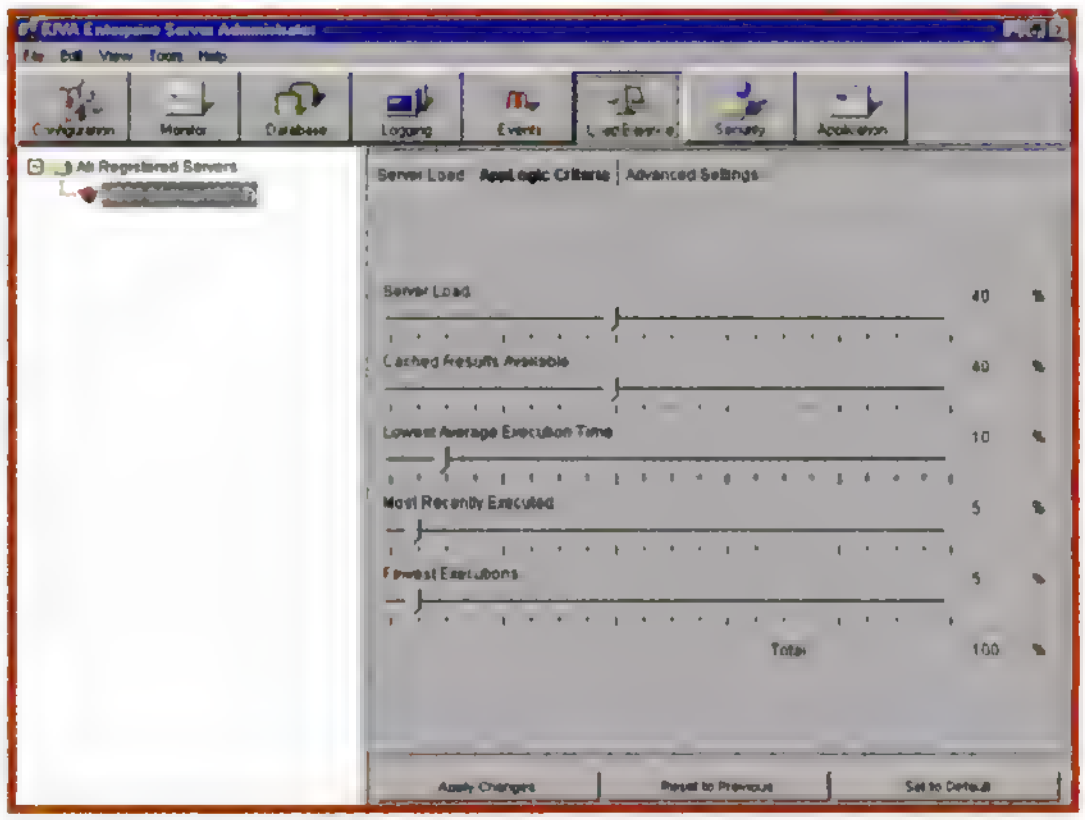

FIGURE 2: *In a load-balanced environment, Netscape Application Server uses a sophisticated algorithm to determine the best way to distribute load across available servers.*

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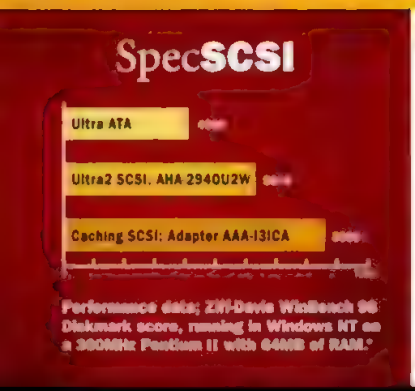

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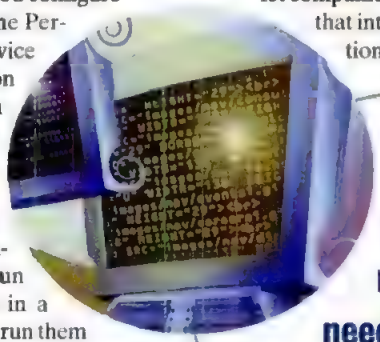
(such as a security service or an RDBMS service) that exists on a single machine.

You build a multimachine application environment (or cell) by merging partitions configured on individual machines. On each machine, you configure all the services you want to run using a Java application called the Command Center. While the NAS execution environment consists primarily of the KXS, KAS, KJS, and KCS services, NetDynamics breaks out server processes more granularly. In addition to the Service Manager, which manages the other services on a machine, the Command Center lets you configure other services such as the Persistence Engine service (which stores session data), the Connection Processor (CP) service (which processes client requests), and the RDBMS service (which manages database connections). You can run each of these services in a separate Java process, or run them in the same process.



Some of the services, such as the CP and RDBMS services, launch other processes called workers that actually handle incoming requests. For example, if you configure four CP workers within a CP Service, you can start four processes to handle requests from Web browsers. Further, you can configure multiple clients requests per individual worker and have each request run in a separate thread within each process.

NetDynamics gives you a lot of flexibility in configuring the number of CP and RDBMS services and workers on any single server—you simply add CPs and RDBMS services however you see fit, tune the number of workers per service, and specify each service to run either in-process or out-of-process. But in a multiserver environment, NetDynamics isn't quite as flexible. By default, each new HTTP request to a Web server gets forwarded in random sequence to any available NetDynamics CP service (on any machine) in the cell. Unlike NAS, NetDynamics doesn't use system load parameters to route requests to less-used machines.

INTEGRATING WITH EXISTING SYSTEMS

In most real-world environments, developers don't have the opportunity to build applications completely from scratch. In many cases they need to interface with applications in other systems, such as IBM/CICS, Tuxedo, or SAP R/3 financial systems. Traditionally, the integration process would involve building an API layer between the legacy system and the application server and accessing legacy services through the API layer.

Both Netscape and NetDynamics respond to the need to streamline the process of legacy integration. NetDynamics, through its Platform Adaptor Component (PAC) modules, has built interfaces into SAP R/3 and PeopleSoft business applications that let developers visually build access into those systems from within Studio. Netscape, through its Netscape Extension Builder (NEB), has built extension modules to integrate with IBM MQ Series, CICS, IMS, and BEA Tuxedo. Both vendors provide toolkits to let companies develop additional modules that integrate other business applications into their application server environments.

Netscape and NetDynamics respond to the need to streamline the process of legacy integration.

THE FINAL WORD: PROCEED WITH CAUTION

Application servers are complex products. They strive to do a lot more than a standard Web development tool, and they do a good job of addressing many of the inherent complexities of business-critical Web-enabled applications. On the other hand, the product category is a newly emerging and developing one, and you will be much better off proceeding with caution when using these products. Plan for a considerable amount of testing of each product feature within your specific business environment. A little planning up front will save you many months of trouble down the road.

NetDynamics 4.02. List price: $14,000 per server; $895 per developer. NetDynamics Inc., Menlo Park, CA; 650-462-7600; www.netdynamics.com. *524 at www.pcmag.com/infolink.*

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Making E-Mail Secure

Here's how S/MIME can safeguard your communication—and why it sometimes doesn't.

By Sheryl Canter

When people think of the Internet they usually think of the Web, but a 1997 Computer Intelligence study found that e-mail is used by a larger percentage of people on the Internet than Web users (for more information, see *www.infobeads.com*). E-mail is infiltrating all parts of our society—replacing paper office memos, helping geographically dispersed families and coworkers keep in touch, and letting people share their thoughts with pen pals around the world. As people come to rely more on e-mail as a means of communication, more e-mail content is requiring privacy. There have always been proprietary ways to encrypt and secure electronic communications, but until recently there has been no standard solution that could work with a variety of e-mail clients. The S/MIME (or Secure Multipurpose Internet Mail Extension) specification is meant to fill this need.

Several vendors have made stabs at S/MIME implementations—including Microsoft and Netscape—but today's S/MIME products do not yet offer the ease of use, reliable security, and transparent interoperability necessary for broadscale adoption. (For reviews of most of the currently available S/MIME products, see "Protection at the Desktop," *PC Magazine*, September 9, 1997. Microsoft Outlook Express, a strong entrant into the S/MIME market, had not yet been released at the time of this roundup.)

Many S/MIME products are hard to use, because S/MIME itself is complicated. Interoperability problems arise, because the S/MIME specification is still in flux. Security holes resulting from design flaws are common, because there is no official document that describes how the elements of S/MIME are supposed to work together. In this column we'll describe the technology that underlies S/MIME and the way the pieces are supposed to fit together to provide a secure e-mail system.

WHY E-MAIL IS VULNERABLE

S/MIME is not an Internet-specific standard—it can be used on proprietary networks such as AOL and CompuServe—but it is most useful for Internet e-mail. On a private network, the sender connects directly to the server. On the Internet, messages bounce from place to place until they reach their destinations. This means there are many more opportunities to tamper with an Internet e-mail message.

Not all Internet communication has this "multihop" characteristic. When you browse the Web, you directly connect to each server you visit. Because of this, Web communication can be made secure by securing the channel—the connection between your computer and the server. But Internet e-mail can pass through several servers before reaching its destination, so securing the channel is impossible. Instead, the message itself must be secured.

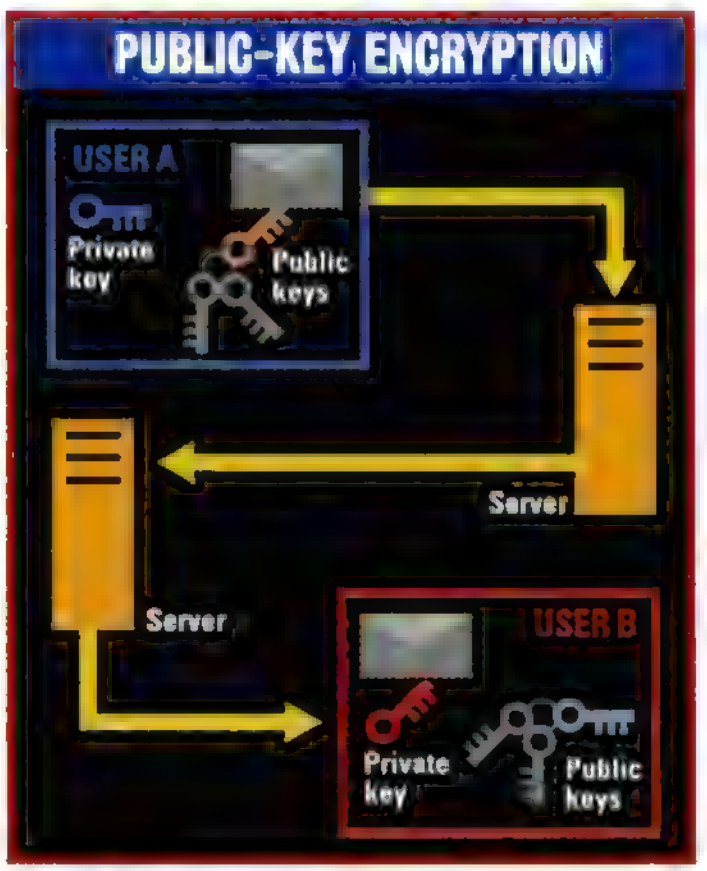

FIGURE 1: *When user A wants to send a secure message to user B, he encrypts the message with user B's public key. When user B receives the message, he decrypts it with his private key.*

There are three types of e-mail security violations: snooping, tampering, and forgery. Encryption techniques are used to protect against all three. We'll start with snooping—reading your private e-mail without authorization. Traditional, single-key encryption can't stop snoopers. In single-key encryption (also called symmetric encryption) the same key is used both to encrypt the message and to decrypt it. This is unworkable for e-mail communication, because there is no safe way to transmit the key. It's unsafe to send the key unencrypted, and it's inconvenient to deliver keys manually to e-mail recipients who may be halfway around the world.

ASYMMETRIC ENCRYPTION

One way to transmit a key safely is to use a technique called *dual-key* or *asymmetric* encryption, which has separate keys for encrypting and decrypting. People's public keys are used to encrypt the messages sent to them, and they use their private keys to decrypt these messages (see Figure 1). The two keys are mathematically related, but the private key cannot be derived from the public key, so the public key can be freely distributed. The private key need never leave the owner's computer.

To send an encrypted message, you obtain the recipient's public key and encrypt the message using this key. Since decryption requires the associated private key, only the recipient will be able to read the message.

There is one problem with dual-key encryption: It's processor-intensive and takes a long time, longer than the average user is willing to wait. So S/MIME instead uses a hybrid approach called a digital envelope. The message is encrypted using a symmetric cipher, and then the symmetric key is encrypted with an asymmetric cipher and sent along with the encrypted message. Since the symmetric key is relatively short, this is much quicker than encrypting the entire message asymmetrically.

S/MIME protects against tampering, the second type of security violation, with a technique similar to a checksum. A hash algorithm condenses the message content into a unique digest, and then the digest is encrypted and sent along with the message. The recipient's S/MIME program decrypts the message and does its own computation of the digest. It then decrypts the e-mailed digest and compares the material to the computed digest. If the two match, then the message has arrived intact. If they don't, someone has tampered with the message and the S/MIME program will alert the recipient of this.

SIGNING AND TRUST

S/MIME protects against the third type of security violation—forgery—by signing, or encrypting with a private key. A signed public key is called a *certificate* and is sent along with the message. The simplest example of this is a self-signed certificate, a public key signed by its associated private key. If the recipient can successfully decrypt the certificate with the sender's public key, that confirms that the sender's private key (presumably accessible only to the sender) was used to create the certificate. (The public key, it turns out, can decrypt a message encrypted with the private key—the reverse of the normal process. Most S/MIME programs keep private keys private

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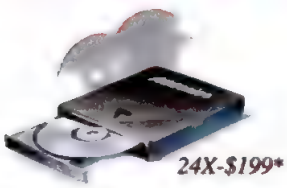

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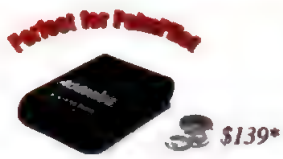

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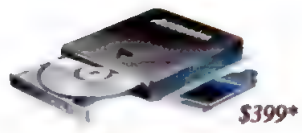

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by requiring the user to enter a passphrase before accessing the key.)

But anyone can create a key pair, so this doesn't prove much. If this is the first time that you (as the recipient) have received a message from a certain person, then the public key is not in your database and you can't verify it. So how do you know that the e-mail address isn't spoofed? How do you know that the person really is who he or she claims to be?

A more secure type of certificate is one signed by a third party. But anybody can sign a public key, so simply having a certificate signed by a third party isn't proof of identity unless the signer is known and trusted. To this end, there are companies that set themselves up as certificate authorities, verifying the identity of the person holding the public key before signing it, much like notaries public.

Even this isn't a perfect solution, however. Let's say I work for a small company called XYZ Inc. XYZ has an internal e-mail system and acts as a certificate authority for its employees. But when I send you e-mail, how do you know that XYZ can be trusted to verify my identity—and how do you know that it really is XYZ that signed my public key if you don't have XYZ's public key in your database?

S/MIME addresses this problem by means of a trust hierarchy, also called a *chain of trust*. To reassure you, I also include XYZ's certificate, the public key of XYZ signed by yet another certificate authority. If this second signer is a service that you know (you can thus verify that its public key is the right one) and that you trust, then you can accept my certificate as valid. If the highest level of the chain of trust is known and trusted, then the certificate can be trusted.

The most prominent certificate authority today is VeriSign. A VeriSign public key is readily available—and is preloaded into most S/MIME programs, in fact—so it's easy to verify a VeriSign signature. If you believe that VeriSign does a good job of verifying people's identities, then when you see a VeriSign signature on a certificate, you can believe there's been no forgery.

VeriSign offers two classes of individual certificates. The Class 1 certificate verifies only the applicant's e-mail address. Class 2 certificates cost more and verify the applicant's mailing address as well as the e-mail address. You must enter private information to enable VeriSign to verify your identity, so the information must be transmitted over a secure connection; it cannot be sent through unsecured e-mail.

To obtain the information necessary for Class 2 certificates, VeriSign uses a Web-based form that you access through a secure HTTP connection. Since Microsoft Outlook Express and Netscape Messenger each come with a browser capable of S/HTTP, you can obtain Class 2 certificates with these products. But if you are using an e-mail-only S/MIME program such as Deming's WorldSecure Client, you are limited to a trial Class 1 certificate, since requests are sent unsecured through e-mail. Trial certificates are provided at no charge, but they are temporary and can't be revoked early if you have problems.

Eventually, VeriSign plans to implement a certificate-signing request system, which will enable you to paste your public key into the secure Web form instead of sending the signature request in e-mail. When this system is in place, you'll be able to receive Class 2 certificates with any S/MIME program. But so far, VeriSign has been concentrating its efforts on getting the S/HTTP interface working for Microsoft and Netscape customers.

> S/MIME users can sign messages without encrypting them, and in fact this is a common use of S/MIME.

CLEAR VS. OPAQUE SIGNING

The chief components in an S/MIME signature are the encrypted digest, the algorithm used to create the digest, the algorithm used to encrypt the digest, and a list of certificates (the trust hierarchy for the message). S/MIME users can sign messages without encrypting them, and in fact this is a common use of S/MIME. If you have the signing feature turned on by default, recipients running S/MIME e-mail programs will be able to check for tampering and verify your identity. They will also receive your public key for possible later use in sending you encrypted messages. But what if the recipient is not running an S/MIME-capable e-mail program?

S/MIME provides for two possible types of signatures: clear (also called detached) and opaque. With clear-signed messages, a message is sent normally and the signature is sent as a small file attachment that can be ignored by non-S/MIME clients. The disadvantage of this method is that some mail servers may slightly modify the message (for example, rewrap lines or trim trailing white space), and this will cause the receiving S/MIME program to report tampering erroneously.

With opaque-signed messages, a message is embedded into the signature data and they are sent together as a single binary file. This protects the message against benign modifications in transit so that reports of tampering will be reliable. But this method also makes the message unreadable by non-S/MIME clients. The message content isn't encrypted—it's readable inside the binary file—but the text is interspersed with binary data.

Some S/MIME programs let you choose between clear signing and opaque signing. Others offer only one method or the other.

PRIVATE-KEY PORTABILITY

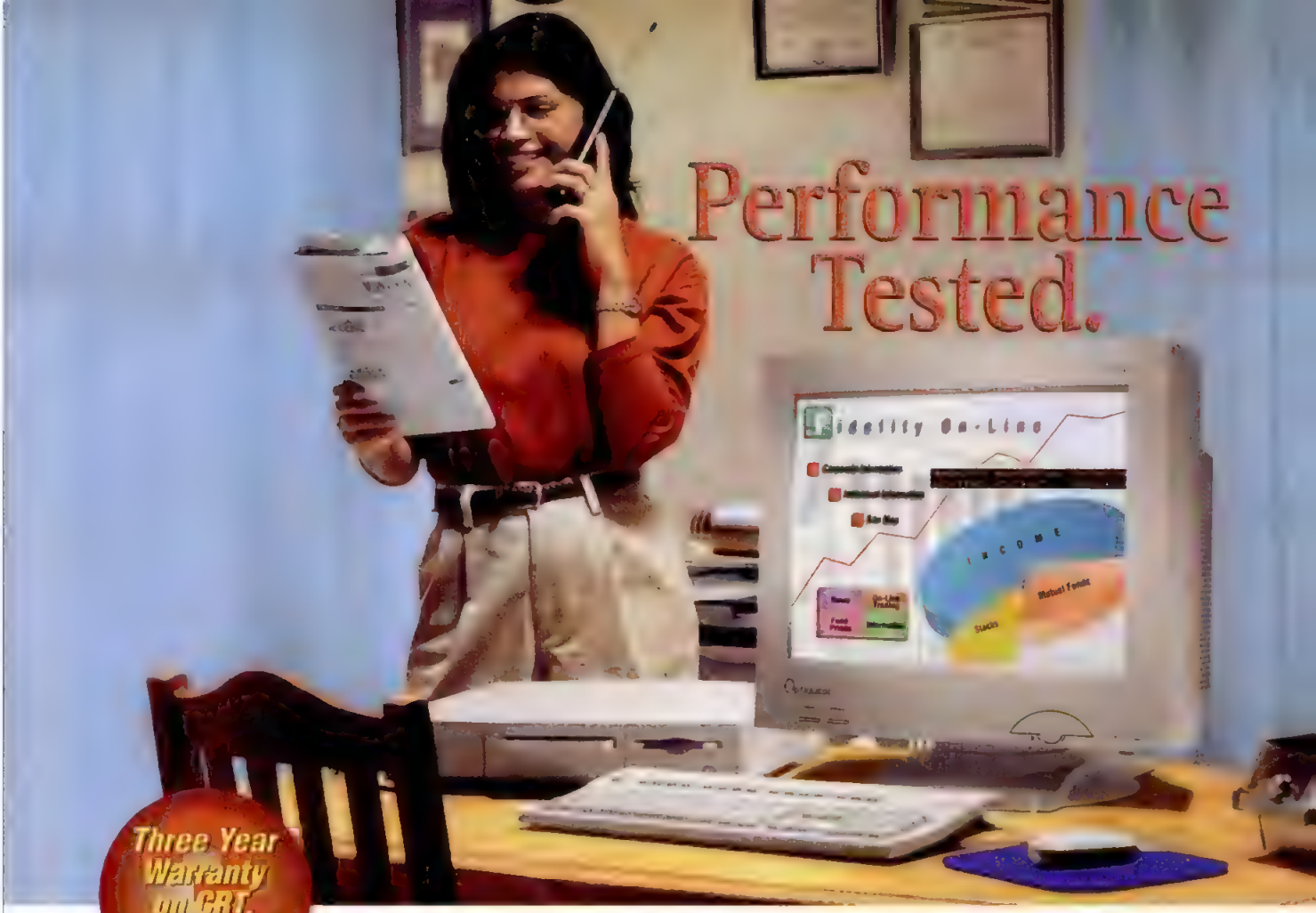
When using S/MIME, you need a means of securely transporting your private key between different computers or e-mail programs. Otherwise, the key pair that you use at work won't be usable on your notebook or home computer, and encrypted e-mail that you pick up from another machine will be unreadable. Also, if you change e-mail programs, you will have to get a new key pair—and make sure everyone sending you e-mail uses it—unless you have a way to export your private key from the old program and import the key into the new one.

The solution to this problem will eventually be Microsoft's PFX standard, which the company submitted as PKCS #12, or the 12th standard in the PKCS (Public Key Cryptography Standards) suite. So far only two vendors have implemented PFX for importing and exporting private keys: Microsoft and Netscape. However, the two versions are not identical. Since the Netscape product shipped first, it uses an earlier version of the still-evolving PFX standard. Thus private keys exported from Netscape Messenger can be imported into Microsoft Outlook Express, but keys exported from Outlook Express can't be imported into Messenger. The import/export capability in the other S/MIME programs, if it's offered at all, generally works only with itself and is not interoperable. This will change when the PFX standard is finalized.

DESIGN CONSIDERATIONS

The S/MIME specification is limited to considerations such as which hash algorithm to use and which symmetric cipher must be supported. It does not address design considerations. Because such issues are not spelled out, products can conform with the S/MIME specification but not meet the security goals of S/MIME.

For example, for the chain-of-trust method to work, an S/MIME program must have some sort of certificate-management system that can set the trust level for certificates and certificate authorities. If a certificate is compro-



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mised, you must have a way to mark it as not trusted. If a certificate authority is compromised (for example, by a disgruntled ex-employee), the certificate-management system must be able to cascade the "not trusted" status down to all certificates signed by that authority. Thus a certificate-management system is crucial for implementing S/MIME's chain-of-trust feature, but not all S/MIME products have one.

Another important design consideration is the ability to associate multiple certificates with an e-mail address. It's common for people using S/MIME today to have multiple certificates, because private-key portability is problematic. But even when private keys are easily portable, people may have multiple certificates. For example, a consultant may have a separate certificate for each company she works for. Not every S/MIME program offers this basic capability, however. Netscape Messenger, for example, allows only one certificate per person.

It is also not uncommon to have multiple aliases for the same e-mail address—for example, *scanter@zd.com* and *scanter@mail.zd.com*. Most S/MIME programs, including Messenger and Outlook Express, accept only the e-mail address in the certificate as valid. You can explicitly accept a certificate that's invalid because of a name mismatch, but you can't encrypt a reply to the message unless you edit the address to match the certificate. The authors of the S/MIME specification are working on a solution that will allow multiple e-mail addresses to be associated with a certificate.

To use S/MIME encryption, you need the recipient's public key. As of this writing, there are two ways to obtain it: by manually downloading the certificate from the VeriSign site and importing it into your e-mail program or by saving the certificates received through signed e-mail messages. To make the process easier, some products automatically save such certificates, but this can cause security problems. Also, Netscape Messenger allows only one certificate per e-mail address; when a message from a particular e-mail address is received with a new certificate, the old certificate is automatically replaced in the database with the new one without warning. This makes Messenger vulnerable to spoofing.

Eventually, public keys will be routinely accessible from within S/MIME programs via Internet-based LDAP (Lightweight Directory Access Protocol) databases such as BigFoot and Four11. But today most S/MIME programs do not have LDAP support. Also, only the new LDAP database from VeriSign contains public keys. Outlook Express, because it's so new, has built-in support for VeriSign's LDAP database. You can add new LDAP databases in Netscape Messenger, but the detailed information you must enter in the *Directory Server Properties* dialog isn't published anywhere. Here it is, so that you don't have to go looking:

Description: *Verisign*
LDAP Server: *directory.verisign.com*
Search Root: <blank>
Port Number: *389*
Secure: <unchecked>
Maximum Hits: *100*

INTEROPERABILITY

As mentioned earlier, S/MIME uses a hybrid approach for message encryption. The message is encrypted with a symmetric cipher, and then the symmetric key is encrypted with an asymmetric cipher for secure transmission. The strength of any encryption method is determined by the length of the key: The longer the key, the stronger the encryption.

The S/MIME specification mandates that all vendors must support at least one common symmetric-encryption method. In Version 1 of the S/MIME specification, this method was the RC2 algorithm with a 40-bit key (RC2-40). In Version 2 of the S/MIME specification, which will be finalized by the time you read this, the common encryption method has been changed to Triple DES, an algorithm that uses a 178-bit key.

Vendors are free to use encryption methods even stronger than Triple DES if they want, and this creates a challenge for S/MIME products: how to know what type of encryption to use with a given recipient. A fairly recent addition to the S/MIME specification, called authenticated attributes, provides a way to exchange this information automatically; only the Microsoft and Netscape products implement the method. Neither, however, stores this information in a place where it can be viewed and manually set if necessary. Deming's WorldSecure Client lets you specify the encryption algorithm to use in the address book, but the product does not yet support authenticated attributes.

All the S/MIME products available today support RC2-40 encryption (since that was the standard in Version 1 of the specification), but not all the products default to RC2-40. So even if all the products perfectly implemented every encryption algorithm, confusion over which algorithm to use could itself cause interoperability problems.

In fact, not all S/MIME programs implement every encryption algorithm perfectly. Flaws large and small exist in many of the products currently available. RSA Data Security, which did much of the preliminary work on S/MIME, conducts interoperability tests and posts the results on its Web site (*www.rsa.com*), but its conclusions are misleading. The RSA tests are not as thorough as they should be, and they're usually conducted with early, nonshipping versions of products. A nonprofit organization called the Internet Mail Consortium (IMC) has also started to conduct S/MIME interoperability tests.

THE SAFE ACT

Cryptography has been a subject of intense debate in Washington, D.C., over the last year. Currently, the United States government classifies encryption as an armament, and encryption algorithms with key lengths greater than 40 bits cannot be exported. The government has imposed this limitation because it wants access to people's e-mail, and 40-bit codes can be broken quickly. The IETF (Internet Engineering Task Force) rejected the 40-bit RC2 cipher as an S/MIME standard for the same reason: The cipher is too easy to break. But this means that unless U.S. law changes, S/MIME-compliant programs from U.S. vendors will not be exportable.

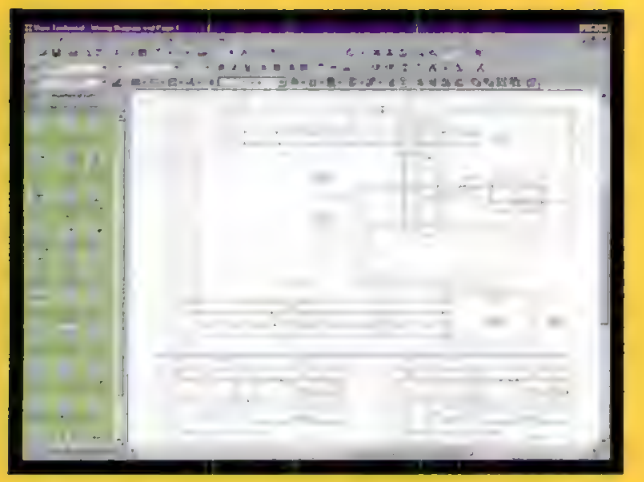
In addition to the 40-bit size limit on encryption keys, the administration has been pushing for a key-escrow system that would require users to give the government copies of their private keys. A 40-bit cipher can be cracked in just a few hours, but the FBI wants to be able to do it in real time, as messages are transmitted.

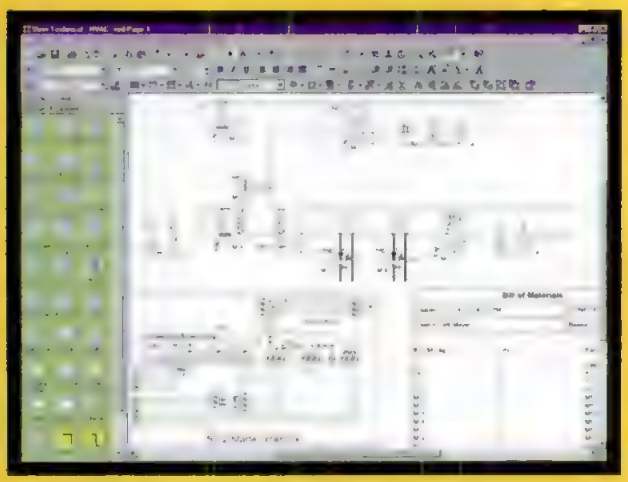
The Security and Freedom through Encryption (SAFE) Act of 1997 addresses both these issues. It proposes export relief for U.S. vendors and prohibits the government from mandating key escrow. A full House vote on the act will probably take place this year. For more information, visit the Center for Democracy and Technology (CDT) cryptography Web page at *www.cdt.org/crypto*.

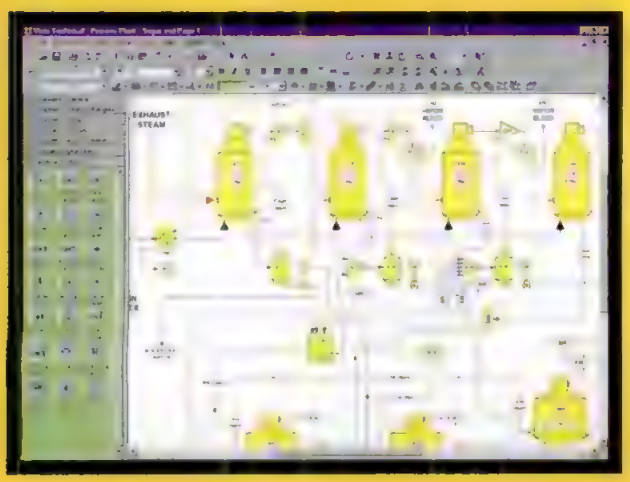
THE WHEEL IS STILL SPINNING

With its strong vendor backing, S/MIME will eventually deliver on its promise of broad-scale e-mail security. But the specification itself is still very much in flux, and this creates interoperability problems. Also, vendors are still learning what features are necessary in a good S/MIME product. Many of the S/MIME products available today lack crucial features or suffer from design flaws. Once the S/MIME specification is finalized and the system is better understood, the market should start to see easy-to-use products that interoperate flawlessly. PC

Sheryl Canter is a contributing editor of PC Magazine.







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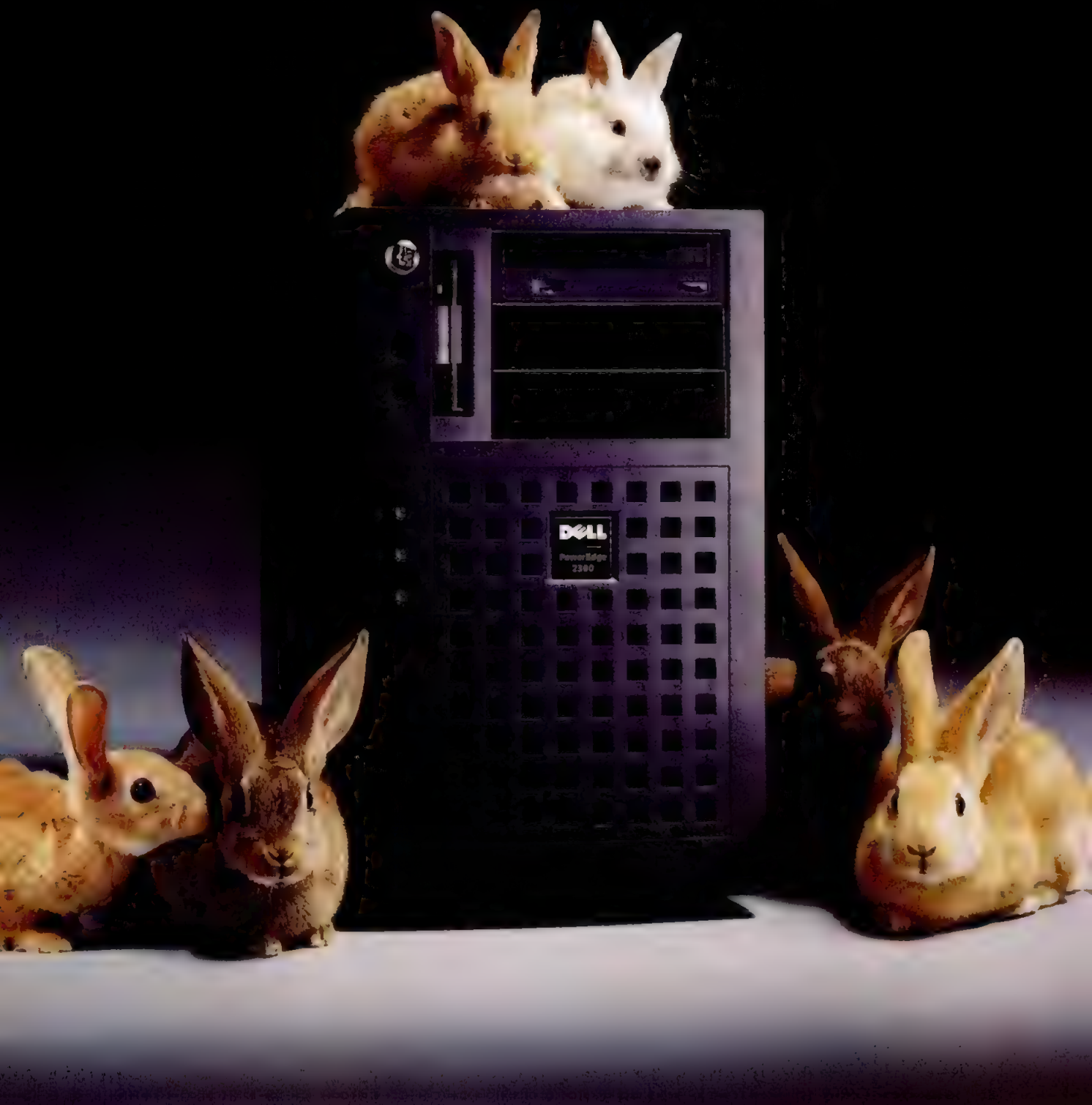

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Explorer Notes 2.0: Make a Note of It!

An enhanced, Windows 98–compatible version lets you add descriptive notes to files displayed in Explorer.

By Neil J. Rubenking

Have you ever looked at a long list of files in your Documents folder and despaired of ever finding the one you wanted? Are you outsmarting yourself with clever, cryptic filenames or wearing out your fingers with long filenames that don't tell you what you need to know? Explorer Notes 2.0 solves these problems by letting you associate a note of up to 255 characters with any file or folder. Explorer Notes 1.0 (introduced in *PC Magazine,* November 5, 1996) worked only under Windows 95 and was incompatible with Internet Explorer 4. Version 2.0 peacefully coexists with IE4 and Windows 98, and it adds support for Windows NT 4 and the current beta release of Windows NT 5. If you created notes with Version 1.0, you can import them into Version 2.0.

Explorer Notes 2.0 integrates with Windows Explorer in a different manner than Version 1.0. The old method was to display notes in an extra column in Windows Explorer. This was a nice idea, but it caused compatibility problems. Version 2.0 does not display notes directly in Windows Explorer but adds a host of new features. You view, add, or edit notes for a file or folder via the right-click context menu. You can search for notes containing a particular string of text using the *Start* menu's *Find* option. Items on the right-click and right-drag menus let you copy, move, rename, or delete a file while automatically updating the note. A comprehensive utility called Note Manager offers tools for backup, repair, cleanup, and other note-management tasks (see Figure 1).

You can obtain Explorer Notes 2.0 for free by download from PC Magazine Online or by mail. Refer to the sidebar "How to Get the Files" for details. The Delphi 3 source code for Explorer Notes 2.0 is also provided for those interested in seeing how it works.

USING EXPLORER NOTES

Explorer Notes 2.0 is supplied as a self-contained install program. Run this program to install EN2 in the directory of your choice. The install program will create the shell extensions for EN2, and it will add Note Manager and the EN2 help file to your *Start* menu. To uninstall EN2, use the Add/Remove Programs applet in Control Panel. Highlight *Explorer Notes 2.0* in the program list, and click *Add/Remove.*

Once EN2 is installed, you can add a new note by selecting a file or folder in Windows Explorer and right-clicking to bring up the context menu. You'll see an item called *Add Note,* marked with a paper-clip glyph. Select this to bring up a dialog box for entering the new note.

To add notes to multiple files or folders at once, select them in Windows Explorer and right-click to bring up the context menu. The item *Append Note* will appear on the context menu. Select this to append a string to existing notes or create a new note for items that don't have one.

If you delete, move, or rename folders using Windows Explorer, EN2 will update the corresponding notes automatically. Because of a limitation in Windows' notification mechanism, this is not true for files, so EN2 provides other ways of handling them. When you select a file that already has an associated note, three items appear on the context menu: *Edit note, Delete w/ note,* and *Rename w/ note* (see Figure 2). Use the EN2 *Delete* and *Rename* options to update the associated notes when performing these operations. The *Rename* option can also move the file to a new location.

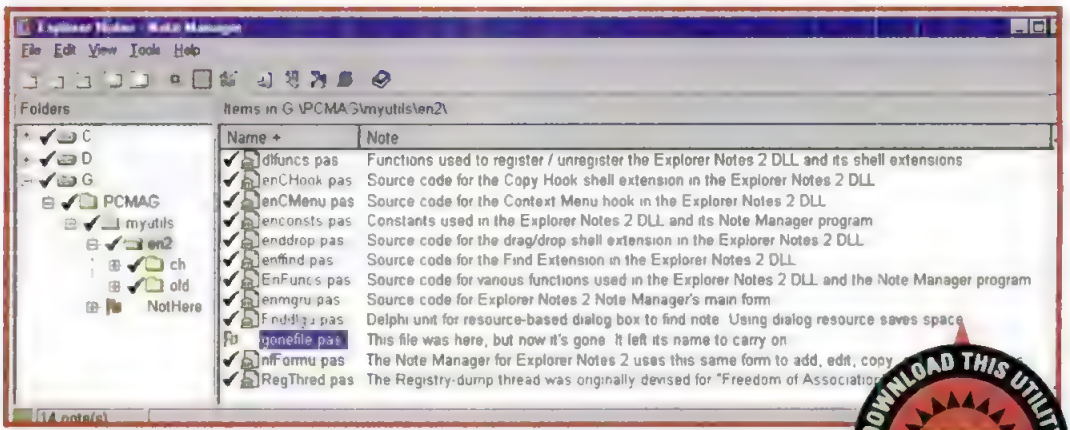

FIGURE 1: *The Explorer Notes 2.0 Note Manager lets you review, edit, back up, and otherwise manage notes you have associated with your files.*

EN2 handles copies and moves by adding items to the right-drag menu. Whether or not EN2 is installed, when you want to drag files to a new location, it's always best to do so using the right mouse button. If you use the left mouse button, a com-

For Programmers Only Explorer Notes 2.0 is a 32-bit Windows program written in Borland Delphi 3. It uses three different context-menu shell extensions to implement right-click menu items, right-drag menu items, and a Find menu item. The source code for Explorer Notes 2.0 is available from PC Magazine Online (*www.pcmag.com*). It demonstrates how to:

- create a generic context-menu object for communication with Explorer;
- use advanced features of the SHBrowseForFolder API function;
- bend Delphi to meet special needs.

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plex set of rules and Shift key overrides determine whether the files are copied or moved. If you right-drag instead, a menu appears that lets you select whether to move the files, copy them, or create shortcuts.

If one or more of the files being dragged has an associated note, EN2 will add two items to this menu: *Copy Here w/ note(s)* and *Move Here w/ note(s)*. These menu choices perform the desired action and also copy or move any notes associated with the files. (Note that if the only items selected are folders, EN2 will not add the right-drag menu items; notification is automatic for file operations that involve folders.)

There is one minor limitation when you drag multiple files to a new location. This arises when you abort the action for any of the files (perhaps because a file of the same name already exists at the destination). Windows informs EN2 that at least one action was aborted, but it doesn't indicate which action or even how many. So when this occurs, EN2 displays a dialog saying that some of the move or copy operations have been aborted and asking whether you'd like to move or copy over the notes anyway.

EN2's notes reside in the registry, not on-disk with the files, so you can assign notes to files on read-only devices such as CD-ROMs. Note, however, that EN2 cannot distinguish one CD-ROM disk from another. If two different CD-ROM disks have a file with the exact same name in the exact same folder, a note assigned to one will also apply to the other. The same is true of floppy disks, Zip disks, and any other removable media.

You can use a file's associated note to locate the file on your hard disk. To search for notes that contain a specific string, choose *Find* from the *Start* menu and then select *Explorer Note*. In the resulting dialog, type your search string in the edit box and click the *Find Next* button repeatedly until you find the note you want. The file with the note containing your search string will be displayed below the edit box. Click the *Explore* button to open Windows Explorer with the found file highlighted. (If you are running Windows 98 or Windows 95 with IE4, and Windows Explorer has been configured to display folders as Web pages, the correct folder will open but the file may not be highlighted.)

NOTE MANAGER

Most of the time you'll use EN2's features from within Windows Explorer. However, from time to time you will want to review your collection of notes, correct any errors, back them up to a file, and so on. EN2's Note Manager performs these functions, and it also lets you enable or disable its integration with Windows Explorer. The main window (shown in Figure 1) is similar to that of Windows Explorer, with a tree-style drive and folder view at left and a list of files on the right. However, Note Manager's right-hand pane shows only the files and folders that have associated notes, and the left-hand pane shows only as much of the directory tree as is necessary to reach these files.

EN2's notes are stored in the registry for rapid access. Since the registry can become corrupted or otherwise damaged, it's wise to back up your notes to a file. When you select *Back-up notes* from Note Manager's *File* menu, EN2 exports all of your notes to a file in RegEdit's REG format. Choose *Restore notes* and Note Manager will call on RegEdit to merge the exported notes back into the registry.

From the *File* menu, you can also connect or disconnect EN2's integration with Windows Explorer. In this way you can disable EN2 without uninstalling it. After making either choice, you will be logged out of Windows. The left end of the status bar at the bottom of the window is green if EN2 is connected to Windows Explorer, red if not.

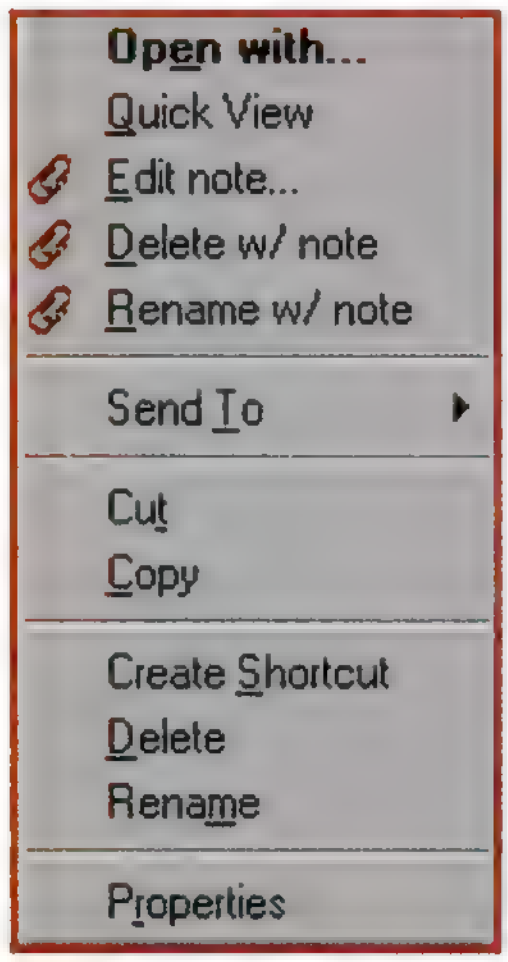

FIGURE 2: *Each menu item added to Windows Explorer's right-click context menu is flagged with a red paper-clip glyph.*

From the *Edit* menu, you can create a new note for any file or folder on the system. If a file or folder is selected in the right-hand pane, you can edit or delete its note, copy its note to another file or folder, or transfer its note to another file or folder. The edit, delete, copy, and transfer choices also appear on the right-click context menu for the right-hand pane.

The *Edit* menu's *Fix folder name* item is enabled only when the highlighted folder in the left-hand pane is an "orphan"—one that exists in EN2's data but not on-disk. This could just be a folder that resides on a removable disk that's not presently in the drive, but it could also be a folder that has been renamed in a DOS box.

When you choose this menu item, a dialog box will appear that lets you choose the correct location for the orphan folder. Any folder that already appears in EN2's database is not a valid target; when such a folder is selected, the *OK* button is disabled and the folder name appears in parentheses. The *Fix folder name* menu item also appears on the right-click context menu for the left-hand pane.

The *Tools* menu lets you locate files or notes and identify problems. Use the *Find file or folder* option to search for a file or folder whose name matches a wildcard file specification. Each asterisk represents zero or more characters, and each question mark represents exactly one character; the filename and extension are processed separately. For example, "*ug?.txt" would match "ugh.txt," "bugs.txt," or "tough.txt," but not "mug.txt." Note that unlike old-style DOS file specifications, this format permits multiple asterisks. "N*O*T*E" could match "NarcOTizE," "NeOnaTE," or "NegOTiablE" (as well as "NOTE"). The found file will be highlighted in the display. In the same way, the *Find note* option lets you search for a file or folder whose note contains a particular string.

The *Find problem* option searches the note database for orphans (again, items that no longer exist on-disk). Orphaned folders are flagged in the tree view, as noted above. A note-equipped file or folder in the right-hand pane will also be flagged if it doesn't exist on-disk. A red flag indicates a file whose parent folder is an orphan. A yellow flag indicates a file that doesn't exist on-disk, within an existing folder. Probably the file has been deleted, renamed, or moved without EN2's knowledge. You can solve the problem by deleting the note or transferring it to the file at the new name or location.

The last item on the *Tools* menu, *Explorer*, is enabled if an existing file or folder is highlighted in the list display. This item also appears on the list display's right-click context menu. When you select it, Note Manager will launch Windows Explorer and highlight the selected item. Note that under Windows 98 or Windows 95 with IE4, if you have configured Windows Explorer to display folders as Web pages, the correct folder will be opened but the item may not be highlighted.

The *View* menu items let you hide or show the toolbar and status bar and sort the list on the right by filename or note. Once you've clicked a sort option, each subsequent click on the same option will reverse the sort order. You can also click on the column

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headings for the same effect. The *Expand All* menu item completely expands the folder tree in the left-hand pane. The *Collapse All* item collapses it so that only the drive letters show. These two options are also available on the right-click context menu for the left-hand pane. Choose *Refresh* (or press the F5 key) and Note Manager will reread the note database from the registry. If you update your notes from within Windows Explorer while Note Manager is running, you will need to refresh the display for Note Manager to reflect the changes.

INSIDE EXPLORER NOTES

EN2 is integrated with Windows Explorer through shell extensions that are COM (Component Object Model) objects. A Delphi 3 object can function as a COM object and implement multiple COM interfaces by including the interfaces in its type declaration. Explorer Notes uses three different context-menu shell extensions to implement the right-click menu items, the right-drag menu items, and the *Find* menu item. All three are descendants of a generic context-menu object that I devised to handle the actual communication with Explorer. This technique could be used in any object-oriented language.

When the user selects *Fix folder name* in Note Manager, the program calls the `SHBrowseForFolder` API function to display a folder-selection tree. This underused function has some advanced features that allow Note Manager to put a *Help* button on the browse window, control its placement, and monitor the user's selection. In the section that follows, I'll discuss both of these points, as well as some special tips for Delphi enthusiasts.

A CONTEXT-MENU OBJECT

A context-menu shell extension is a COM object that implements the `IShellExtInit` and `IContextMenu` interfaces. Depending on how it's registered with the system, a context-menu shell extension can extend the right-click context menu, the right-drag menu, or the *Find* menu. Windows Explorer passes the list of selected files to the `IShellExtInit.Initialize` method, along with a folder name. This folder name represents the destination in a right-drag handler or the source in a right-click handler. If the call to `IShellExtInit.Initialize` succeeds, Windows Explorer then calls the `IContextMenu.QueryContextMenu` method. The programmer must implement this method so that it adds one or more items to a menu handle supplied by Explorer. Other `IContextMenu` methods return the menu text and help text and perform the action.

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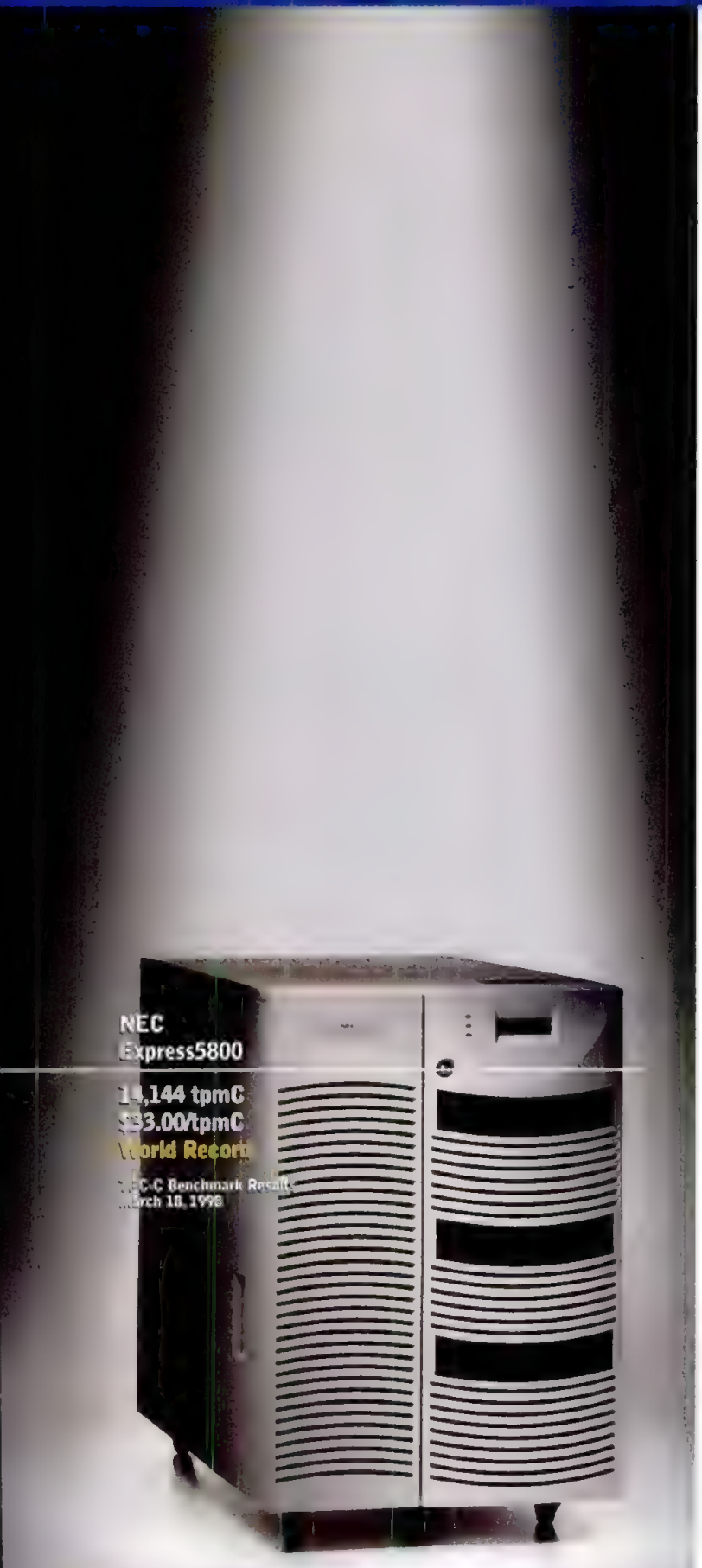

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tion involved in processing the list of selected files, and a lot of repetition in the other methods. Instead of writing three separate context-menu shell extensions, I created a generic ancestor object called TGenContMenu (defined in Genamenu.pas) to encapsulate all the repetitive code. I also defined a simple object type, called TGenConAction, to associate a context menu action with its menu text, help text, and optional menu bitmap.

The IShellExtInit.Initialize method calls TGenContMenu.AddActions after extracting the file information. AddActions is defined as an abstract method, meaning that every descendant of TGenContMenu must override it to add specific actions. The generic context-menu object gets all the necessary information from the action objects, and the descendants contain as little code as possible.

Delphi 3 does not support multiple inheritance (MI) for its own objects. However, the support for COM interfaces provides a kind of MI, and with MI come problems. The TGenContMenu object needs to override the Initialize method of its parent object, TComObject, as well as the Initialize method of the IShellExtInit interface. The line

```
function IShellExtInit.Initialize =
ShInitialize;
```

in the definition of TGenContMenu avoids a name collision by instructing the compiler to treat the method ShInitialize as the Initialize method for IShellExtInit. For details on the ShInitialize method, please refer to the source code, which is available for download with the utility.

BROWSING FOR FOLDERS

The modern 32-bit Windows shell includes a very handy function called SHBrowseForFolder. This function takes as its argument a BROWSEINFO structure, which controls a wide variety of behaviors. This function can browse the whole system or restrict its display to just computers on the network, just printers, or just actual file folders. An optional callback function in the calling program can monitor the user's activity in the dialog. EN2 puts SHBrowseForFolder through its paces in response to the *Fix folder name* menu item.

By rooting the folder-browsing tree at My Computer and including BIF_RETURNONLYFSDIRS and BIF_DONTGOBELOWDOMAIN in the flags, EN2 restricts the display to actual file folders on the local machine. The itemid list representing My Computer is obtained by passing the value CSIDL_DRIVES to the API function SHGetSpecialFolderLocation. And because the flags include BIF_STATUSTEXT, the browse window includes a status label whose contents can be controlled via the callback function.

When Windows has created the browse window, the callback function receives the message BFFM_INITIALIZED and the handle of the browse window. It responds to this message by adding a *Help* button to the browse window and subclassing the window to supply the help. It also positions the browse window just below the item whose location is being corrected. This location has been passed in the user-defined lParam field of the BROWSEINFO structure.

Each time the user changes selection within the browse window, a BFFM_SELCHANGED message is sent to the callback. If the newly selected folder already has one or more note-equipped files within it, the callback function disables the *OK* button and displays the folder name in parentheses. Otherwise the function enables the *OK* button and displays the folder name without parentheses.

SHBrowseForFolder is a very handy way to permit selection of a folder. With a few tweaks to the settings in the BROWSEINFO structure, you can force the browse window to show precisely what you want it to, and you can integrate it thoroughly with your program.

A DELPHI GRAB BAG

The tantalizing TCoolBar component in Delphi 3 provides a complete implementation of the multipart toolbar found in Internet Explorer. Unfortunately, a program that uses it won't work on systems whose Comctl32.dll has not been updated by Internet Explorer. The TToolBar component is a more widely usable solution but has its own problems. When a program containing a TToolBar runs on a system whose version of Comctl32.dll is different from that of the system where the program was compiled, the buttons come up blank. This is because the TImageList components that hold the button images appear to be empty.

Delphi 4 sidesteps this problem by defining its own toolbar implementation, independent of Comctl32.dll. In Delphi 3, instead of preloading the bitmap images into the TImageList components at design time, you should store them as bitmap resources and load them into the TImageLists when the program starts.

If you peruse the code modules used in En2dll.dpr, you won't find any references to the familiar Forms unit or to any of the units that define visual Delphi components. The DLL weighs in at a bit over 100K, and adding support for visual components like forms, buttons, edit boxes, and so on would more than double that size. Given that the DLL will be in memory most of the time, its size is significant. To keep the size down, I hauled out my Windows 3.*x* references and designed the *Find* and *Edit* dialog boxes the old-fashioned way. For each one, I defined a dialog-box resource template and a message-handling function. When you're accustomed to visual form design and object-oriented message handling, this kind of programming seems incredibly tedious, but the process was worthwhile to keep the DLL's size down.

Since EN2 avoids the low-level trickery of its predecessor, it ought to survive the next few tweaks that Microsoft makes to the operating system. Its new search feature and improved ability to manage file/note associations make it more useful than ever. PC

Neil J. Rubenking, the author of Explorer Notes 2.0, is contributing technical editor of PC Magazine. *Sheryl Canter is the editor of the Utilities column and a contributing editor of* PC Magazine.

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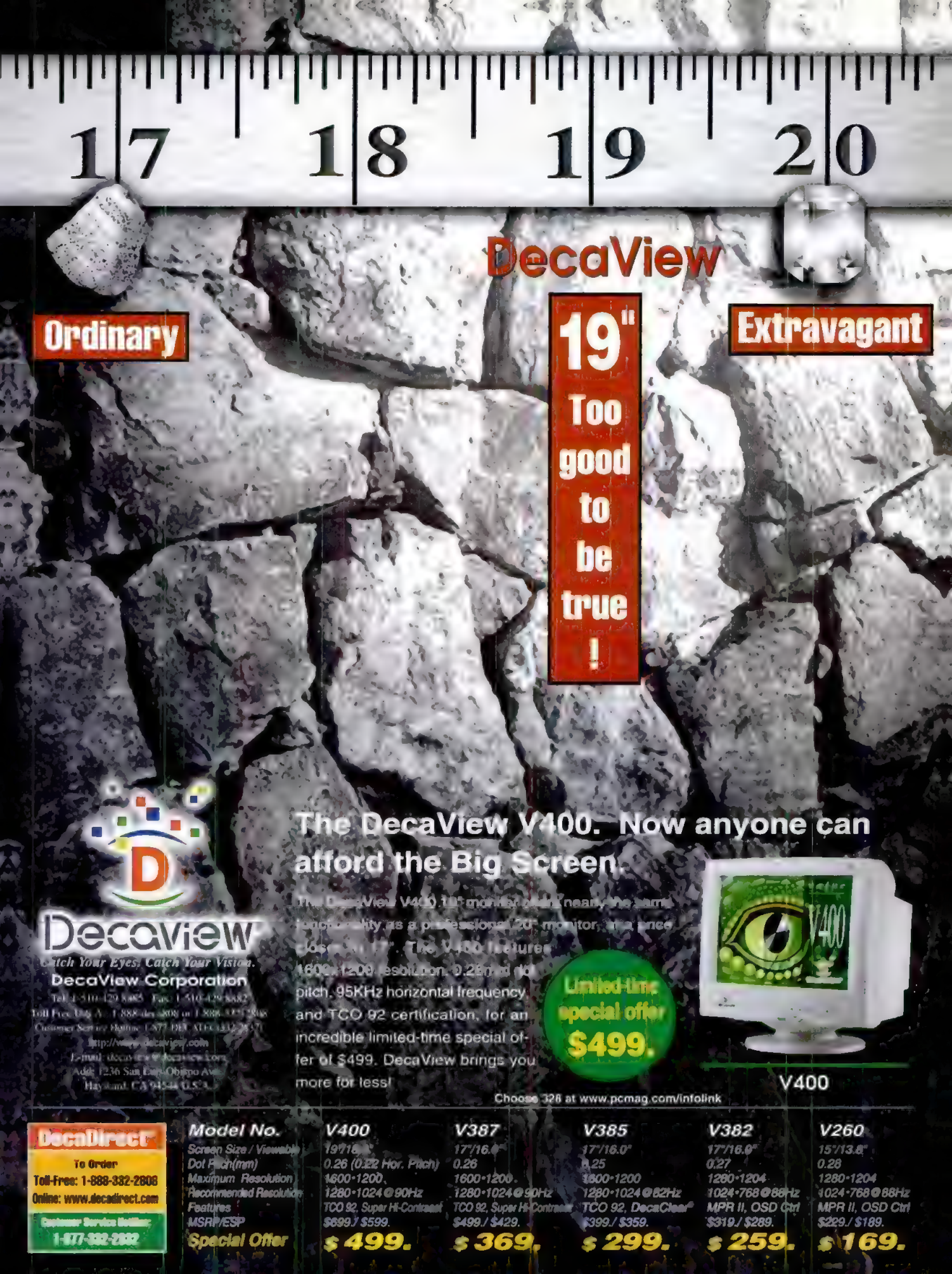

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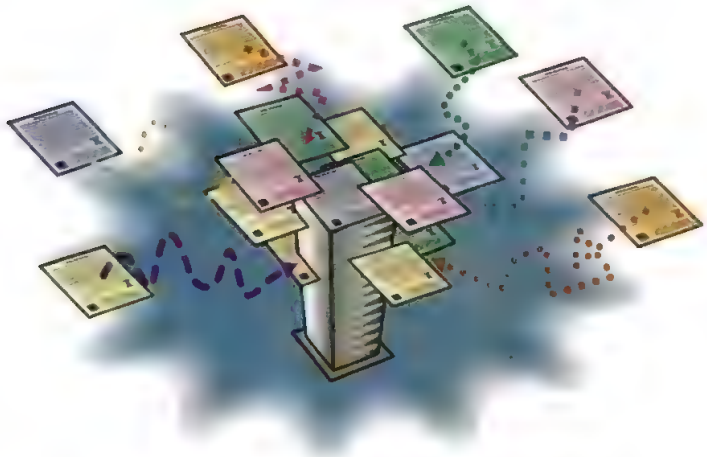

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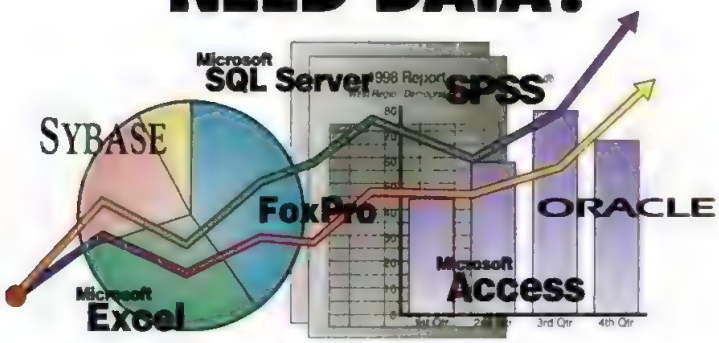

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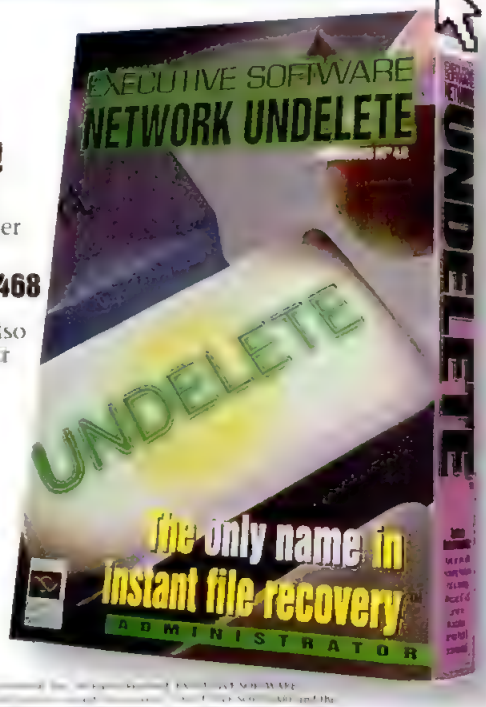

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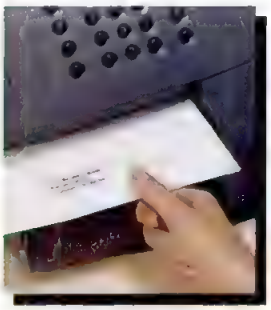

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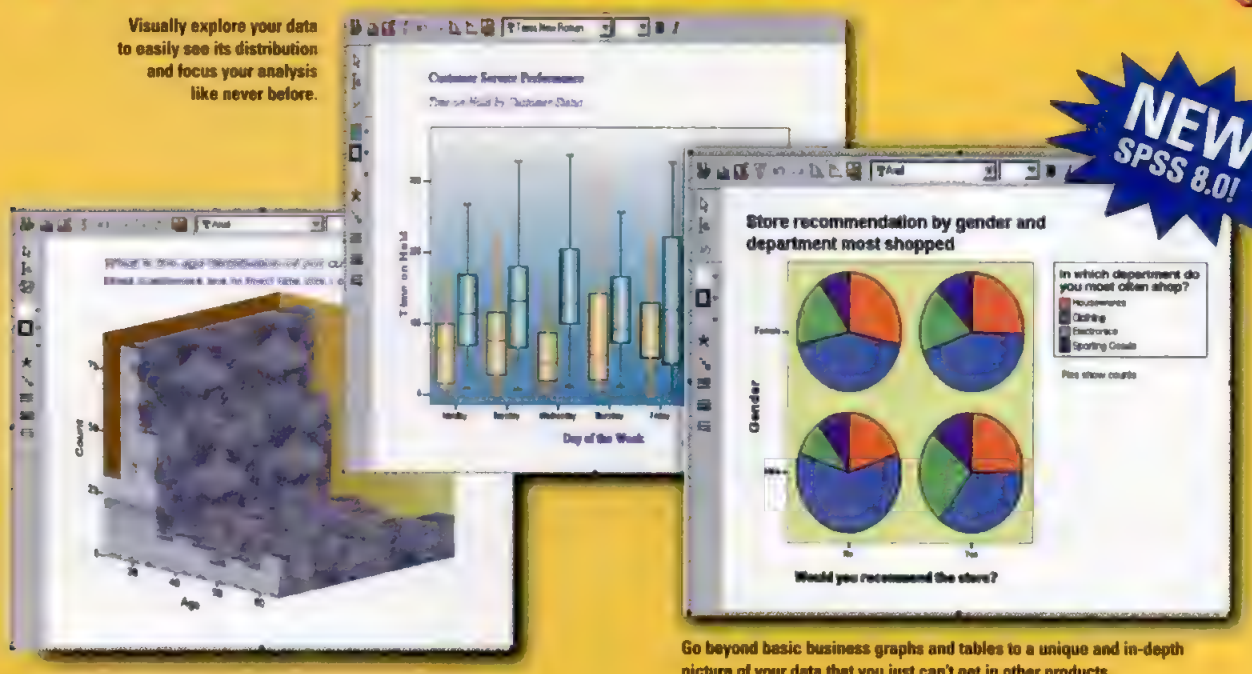

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User-to-User

BY NEIL J. RUBENKING

New Commands on Right-Click Menu for Folders

Here's a quick way to open a command prompt by right-clicking on a folder. In Explorer, choose Options *from the* View *menu and click the* File Types *tab. Select* File Folder *and click* Edit, *then* New. *Call the action* Prompt, *and for* Application used *enter* Command.pif /K cd "%1", *then click* OK. *Now when you right-click on a folder and choose* DOS Prompt, *the DOS window will open in the folder that was right-clicked.*

ROY SINNAMOND
via the Internet

At times you may want to print directory listings under Windows 95. Rather than shelling out to DOS, you can use this easy way to automate the process for any directory or drive. Start Explorer, select Options *(or* Folder Options *with IE 4 installed) from the* View *menu, and then select* File Types *and* File Folder. *Select* Edit, *then hit the* New *button. In the first text box, type in* Print Directory. *If you type* command.com /c dir > prn *in the next text box, you'll be able to right-click to print the directory just as you would see it in DOS. With DIR's command options, however, you can tune the listing to your liking (typing* dir /? *will show you all the options). My choice is* dir /on /l /v, *which sorts by name, uses lowercase, and gives you more disk information (such as total disk space and percentage in use). To print this type of listing, enter* command.com /c dir /on /v /l >prn. *Then press the* OK *buttons until you leave all the dialogs.*

If you want to print entire directory trees, you might want to make a separate command called Print Directory Tree. *Just follow the steps above, but add the* /s *switch after* dir. *To print root directories of a disk, follow the same steps as well, but choose* Drive *for the file type instead of* File Folder.

Now, in Explorer, right-click on a directory and the option to print a directory or a directory tree should be there! This new command will open a blank DOS box while it sends information to the printer, then automatically close the box.

BEN WATSON
via the Internet

PC MAGAZINE: Note that Explorer's list of file types includes both *Folder* and *File Folder*. What's the difference? *File Folder* precisely corresponds to a directory on the disk. *Folder* can be a file folder, a drive, or a nonfile folder like Control Panel or the Printers folder. The commands we're adding here make sense for directories and for drives but not for nonfile folders.

Following the detailed instructions given by these two readers will give you useful experience in adding new actions to the right-click menu for particular file types. But if you'd rather just get the added functionality with the least fuss possible, you can simply launch the file Foldrcmd.reg, shown in Figure 1. This file installs all three commands (*DOS Prompt*, *Print Directory*, and *Print Directory Tree*) into the Windows registry for both the File Folder type and the Drive type. (Note that within the registry, the File Folder type is called Directory.) I changed the directory-printing commands slightly, replacing `/on` with `/ogn`. The former sorts files and subdirectories alphabetically by name, while the latter lists all subdirectories sorted by name, followed by all files sorted by name.

The REG file is divided into six parts, one for each command. Each has a comment line (which begins with a semicolon), followed by four active lines that install the command. If you don't want to install all of the possible commands, just comment out the action lines by adding a semicolon to the beginning of each one you don't want.

```
REGEDIT4

; DOS prompt for folders
[HKEY_CLASSES_ROOT\Directory\shell\DOS_Prompt]
@="DOS Prompt"
[HKEY_CLASSES_ROOT\Directory\shell\DOS_Prompt\command]
@="command.pif /K cd \"%1\""

; Print directory for folders
[HKEY_CLASSES_ROOT\Directory\shell\Print_directory]
@="Print directory"
[HKEY_CLASSES_ROOT\Directory\shell\Print_directory\command]
@="command.com /c dir /ogn /v /l >prn %1"

; Print directory tree for folders
[HKEY_CLASSES_ROOT\Directory\shell\Print_directory_tree]
@="Print directory tree"
[HKEY_CLASSES_ROOT\Directory\shell\Print_directory_tree\command]
@="command.com /c dir /ogn /v /l /s >prn %1"

; DOS prompt for drives
[HKEY_CLASSES_ROOT\Drive\shell\DOS_Prompt]
@="DOS Prompt"
[HKEY_CLASSES_ROOT\Drive\shell\DOS_Prompt\command]
@="command.pif /K cd \"%1\""

; Print directory for drives
[HKEY_CLASSES_ROOT\Drive\shell\Print_directory]
@="Print directory"
[HKEY_CLASSES_ROOT\Drive\shell\Print_directory\command]
@="command.com /c dir /ogn /v /l >prn %1"

; Print directory tree for drives
[HKEY_CLASSES_ROOT\Drive\shell\Print_directory_tree]
@="Print directory tree"
[HKEY_CLASSES_ROOT\Drive\shell\Print_directory_tree\command]
@="command.com /c dir /ogn /v /l /s >prn %1"
```

FIGURE 1: *Launch this Windows registry file to install new commands for drives and file folders on the right-click menu.*

Ask Our Advisors

HARDWARE

Defrag off the Rails

I recently encountered a problem when I went to defragment one of the logical drives on my hard disk. When I tried to defragment my E: drive, the program stopped after completing only 11 percent of the drive. I had to use Ctrl-Alt-Del to open the Close Program *window and shut down the program because it was not responding. I tried again, and it got through 20 percent before halting, then through 32 percent on the third try. I did run ScanDisk thoroughly on the drive before I started. What could be causing this problem?*

BILL CALLIHAN
via the Internet

PC MAGAZINE: Defrag can run into problems if there are flaws on the disk that it's trying to process, but the fact that ScanDisk was run prior to Defrag makes disk errors less likely suspects. The key here is not to believe everything you see on the screen. The progress bar that shows during the Windows 95 Disk Defragmenter's operation can be a useful indicator, but don't rely too heavily on it.

Disk Defragmenter makes an initial estimate of how long it will take to process the disk. This is based largely on how much data is currently stored on the disk. If there are a lot of files that have been deleted from a folder, however, Defrag can spend a long time checking that the files have indeed been deleted, especially if the folder is now empty. This expenditure of time was not taken into account in creating the progress bar, and so it may appear that the program has hung, because the bar does not move—sometimes for as long as half an hour.

The way to cross-check the program's operation is to look at the disk-activity light on your computer. If the light indicates that there is hard disk activity taking place, then Defrag probably has not crashed and is simply tied up working on a portion of the disk that the program did not expect would take so long to process. Go have a cup of coffee, and come back later to see if the progress bar has started moving again.—*Alfred Poor*

Time for a Tonic?

My Pentium/133 system came with 16MB of memory; I recently upgraded to 40MB, but my computer seems to be running slower every day. Someone suggested starting with a fresh copy of Windows 95, but I would hate to start over and reinstall everything. Is there anything else I should try first?

ALICE STRIBLING
Crawfordsville, Indiana

PC MAGAZINE: There are certainly many reasons why your computer may be running slower, many of which would not be helped by reinstalling Windows from scratch. It is fairly easy to check for some of these causes, and fixing them can be far easier than reinstalling Windows.

If your hard disk is *thrashing*—there's lots of disk access activity for what should be a simple operation—then you may have a problem with your storage. If you're low on disk space, then your computer may not be able to create as large a swap file on the disk as it wants. If you have 100MB or less free space on your hard disk when you first start Windows, you may want to try to free more space and see if your speed improves.

It is also possible that some of the sluggishness may have been caused by adding the memory to your system. If you have too little memory installed, Windows will use your hard disk as virtual memory (using the swap file), which is much slower than real memory. If you add more memory, the computer should resort to the swap file less frequently, which will boost performance.

However, most computers have a secondary system-memory cache (sometimes called the *L2 cache*), which lets the CPU access data in memory much faster. If you don't have sufficient L2 cache for your additional main system memory, though, you can actually slow down the system performance.

You can test this by removing some of your system's memory; bring it back to 32MB and see if performance improves. If so, try increasing the amount of L2 cache memory installed in your system. This is a relatively inexpensive upgrade and may bring your system back to its familiar speed.

A rule of thumb is that 128K of L2 cache is sufficient for up to 32MB of memory. For 32MB to 64MB of memory, 256K of L2 cache is sufficient. For 64MB of memory and more, you'll want 512K of L2 cache or more. These amounts vary with the size of the tag RAM associated with the cache and with the cache structure. The problem is compounded by the fact that some chip sets won't cache more than 64MB (and some Intel motherboards can't cache more than 32MB). But as a general rule of thumb, multiply the amount of installed memory in megabytes by 4 to get the desired amount of L2 cache in kilobytes.
—*Alfred Poor*

OPERATING ENVIRONMENTS

Delete GID Files to Gain Disk Space

In a vain attempt to free more space, I've been trying to clean my hard disk. In the process, I've come across GID files. There seems to be one for almost every executable file on my hard disk, and some are 150K! What are these files? Can I delete them, or do they serve some higher purpose that no one but the Microsoft tech wizards could know about?

RUSSELL REHM
via the Internet

PC MAGAZINE: Those GID files are associated with HLP files, not EXEs, but since almost every Windows EXE file has a corresponding HLP file, it's no wonder you were fooled. You'll also find FTS files associated with some help files. These are index files built by WinHelp when you request a full text search. There's no harm in deleting GID or

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FTS files, because WinHelp will re-create them as needed.

By default, GID files are hidden, so the first step in cleaning up your disk is to make sure Explorer can see them. In Windows 95 or Windows NT 4, launch Explorer, choose *Options* from the *View* menu, and check the *Show all files* option button. Click *OK*, then close Explorer. Now choose *Find files or folders* from the *Start* menu. Fill in **.GID* in the *Named* box. Pull down the list labeled *Look in* and choose *My Computer*, so all drives on your system will be searched. Press the *Find Now* button and wait.

When the search is complete, highlight all the found files and delete them. Repeat this process for FTS files. The amount of space you'll save depends on how many help files you've been using and how long it's been since you last performed this cleanup and will often be measured in megabytes. I checked two machines in this office and found 3MB and 7MB wasted on GID and FTS files.

If there are one or two particular help files in which you frequently make full text searches, you may want to exempt their FTS index files from this general deletion. WinHelp will re-create the files as needed, but if the help file is large, that can take several minutes.
—*Neil J. Rubenking*

How Files Are Launched at Start-Up

Several programs are launched automatically when I boot up my machine. The problem is that only one of them is launched from the Start *menu; the others are hidden somewhere deep in the computer, and I can't find out what makes them launch. I want all of these programs to start automatically, but I'd like them to launch from the StartUp folder. This would give me the option of holding down the Shift key when booting up to disable them and thus getting full use of my computer's resources to play games in Windows 95. Right now I hit Ctrl-Alt-Del and shut them all down manually.*

How do I find the code that tells all these utilities to launch? Is there any way to disable these lines and load shortcuts of the executables in the StartUp directory?

TOM HABERSTROH
via the Internet

PC MAGAZINE: As you've noted, the most obvious place to look for programs that launch at start-up is the StartUp folder in the *Start* menu. And indeed you can suppress activation of these programs by holding down the Shift key after the Windows start-up logo disappears. Under Windows 95 and Windows NT 4, there are two other places to look. First, in the `[Windows]` section of Win.ini (usually the first section), look for lines beginning with `Load=` and `Run=`. Any program listed on these lines will run at start-up. The program names are listed one after another, with no command line parameters allowed, and only DOS-style 8.3 filenames can be used. If you find any programs here, create shortcuts for them in the StartUp folder and then comment out the Win.ini lines by inserting a semicolon at the start of the line.

Next run RegEdit and navigate to `HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion`. Below this key, you may find subkeys named `Run` and `RunServices`. The programs listed in the right-hand pane under these keys will run at start-up too. Highlight the `Run` key and export it to a REG file by choosing *Export* from the *Registry* menu. Now, for each value in the right pane, double-click the value name and copy the value data to the Clipboard. Then create a shortcut in the StartUp folder, pasting the copied command string into the *Target* box. When you've created shortcuts for all the programs, right-click the `Run` key, choose *Rename*, and insert a period as the first character in the name. This will disable the automatic launching of files registered in this key. Repeat the whole process for the `RunServices` key, if present, from exporting a REG file to inserting a period in its name.

There's no guarantee that you can successfully move every program into the StartUp folder. Sometimes programs are loaded in these other locations because they must run first, or because they must run before certain other programs. You simply have to experiment, always leaving yourself a way to put things back the way they were.

To restore the `load=` and `run=` lines in Win.ini, delete the semicolon you inserted at the start of the line. To restore the `Run` or `RunServices` registry key, rename them again, removing the period you inserted at the start. The REG files that you created serve as an additional layer of backup: Launch one by double-clicking it in Explorer and the corresponding registry key will be re-created.
—*Neil J. Rubenking*

WORD PROCESSING

Speeding Up Opening Files in WordPerfect 7

Is there a way to speed up the File | Open *command in WordPerfect 7? It seems to take an unreasonably long time.*

PETER YOUNG
via the Internet

PC MAGAZINE: There are several potential causes for this problem and at least as many solutions. One of the simplest likely cures is turning off the *Tree View* and *Preview* features, which according to Corel can cut out as much as 90 percent of the wait.

To disable *Tree View* (which can, in fact, take time to build the directory structure), choose *File | Open* to go to the *Open* dialog, then choose *View*. If there's a check next to *Tree View*, remove it. To turn off the *Preview* option, go to the *Open* dialog and choose *View | Preview | No Preview*.

Another reason the *File | Open* dialog may take an unreasonably long time to appear is that there may be too many documents in a single directory, since WordPerfect has to read the entire list of files. If you have a single data directory with hundreds of files, try dividing it into several different directories with fewer than 100 files each.

In much the same vein, if you have hundreds of items listed in the *Favorites* menu (available in the *Open* dialog box), try cutting the list down to the directories, files, and URLs you actually use regularly. You'll find the Favorites shortcuts in the Windows\Favorites directory, and you can delete them with Windows Explorer. You can also delete items from the list by going to the Windows\Favorites directory from within WordPerfect. Choose *File | Open* to go to the *Open* dialog box. The current path and directory name will show just above the tree or filenames list. If it's not already showing the Favorites directory, chose *Favorites | Go To/From Favorites*. Then select the items you want to delete and either hit the Del key or right-click on the selection and choose *Delete*.

Corel says that having too many fonts in Windows 95 can also slow down the *File | Open* dialog box, and it suggests deleting unneeded fonts. That's a good idea in any case, since doing so will slow Windows down in other ways as well. To delete fonts, go to the Control Panel, choose *Fonts*, select the fonts to delete, and choose *File | Delete*.

Finally, Corel also suggests that if you have the 5/2/96 release of WordPerfect 7, you can minimize this problem by upgrading to the Windows NT–enabled release. At this writing, the Windows NT–enabled CD is free if you have a license for Version 7, except for a $9.95 shipping and handling charge. To check the release date of your current version, set Windows Explorer to show file dates by choosing *View | Details*, then go to your WordPerfect directory and take a look at the date for the Wpwin.exe file. To get the update, call 1-800-772-6735, and have your license

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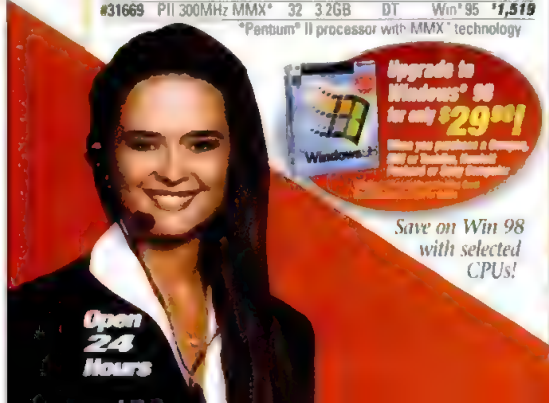

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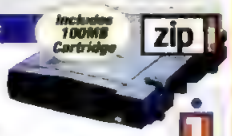

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number ready. The Windows NT–enabled release will work in both Windows 95 and Windows NT.—*M. David Stone*

SPREADSHEETS

Asterisks to Spaces

In the April 7, 1998, issue of PC Magazine, *I read about a macro to replace the asterisk with a tab character in Word. I am using Excel 97, and I have to type a lot of whole numbers and fractions (15 31/32, for example) using the keypad. Hitting the Spacebar between the whole number and the fraction really breaks my stride. How do I obtain a space instead of an asterisk?*

DAN LICATA
McLean, Virginia

PC MAGAZINE: The best way to do this in Excel is to go ahead and type your numbers with asterisks, then do a quick search-and-replace. You can't search for an asterisk directly, however, because Excel's *Search* command treats the asterisk as a wildcard character. To replace asterisks with spaces, you need to specify ~* as your search string.

The following simple macro encapsulates the necessary search-and-replace strings:

```
Sub Fixit()
    Selection.Replace "~*", " "
End Sub
```

To make the macro easier to use, assign a keyboard shortcut to it. Then save it in a file named Personal.xls, stored in your Xlstart directory. (Your Xlstart directory must be a subdirectory of the directory containing your Excel.exe file.) Then the macro will be available every time you start Excel. Enter your fractional numbers with asterisk characters, select the cells containing the numbers you just entered, type the keyboard shortcut for your Fixit macro, and you're done. It beats having your stride broken while you reach for the Spacebar.—*Craig Stinson*

DATABASES

Sending Standalone Access Reports, Revisited

In your January 6, 1998, issue you recommended the package Microsoft Access 97 Snapshot Viewer for creating and distributing Access reports to people who don't have Access. We've faced this problem and have found Adobe Acrobat to be a much better solution, especially for our high-profile, less computer-savvy people. The product lets us simply select the Acrobat printer driver as the output device to create a distributable file.

This solution is virus-free, and the files are tiny. The cost of the writer is $1,595 for a ten-user license, and it makes our lives a lot easier. And people can print and even extract pages to their hearts' content.

PAUL E. DILLMAN
via the Internet

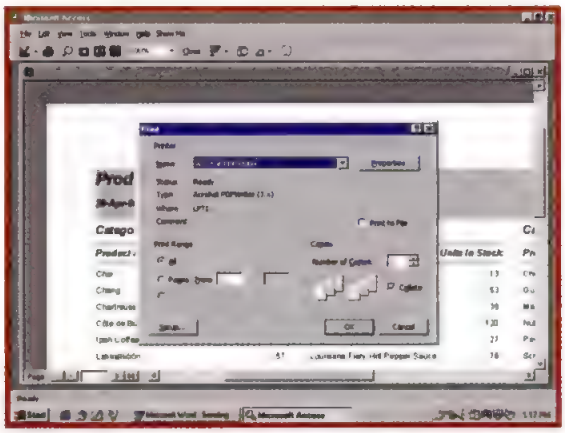

FIGURE 1: *You can use Adobe Acrobat Writer to publish your Access reports in distributable PDF files. Once installed, you just choose the Acrobat PDFWriter printer driver as the output device for your report, as shown here.*

PC MAGAZINE: After reading my January 6 response, a number of readers wrote in or sent e-mail to request a solution that would work for Access 2 and Access 95 as well as Access 97. Adobe Acrobat 3.0 is an excellent choice; it will work for all three products and probably for all of your other software, too. But it's not free, as Access 97 Snapshot Viewer is. To create reports for distribution, you'll need at least the $295 single-user license for Adobe Acrobat 3. Your report recipients will need the free Acrobat Reader, which comes with the product.

That said, Acrobat offers a number of advantages. For one, the product creates Adobe Portable Document Format (PDF) files. PDF files are widely supported on the Internet and within popular Web browsers such as Microsoft Internet Explorer and Netscape Navigator. According to Adobe, more than 250,000 Web sites make documents available in PDF format. Because of that popularity, chances are good that at least some of your correspondents already have the software installed on their computers.

Creating the PDF file couldn't be simpler. You just "print" the report to the Acrobat PDFWriter printer driver (see Figure 1). This is familiar territory to most Windows users and even simpler than the Save As/Export procedure that Access 97 Snapshot Viewer requires. The resulting PDF file is a high-fidelity copy of your report with all formatting and images intact. And Acrobat Reader is more full-featured than Access 97 Snapshot Viewer. For example, you have considerable control over zooming, and you can easily extract pages of a report to another PDF file.

Also, the reader is available for 16-bit Windows (unlike Access 97 Snapshot Viewer). Last but not least, the Acrobat PDFWriter printer driver works with all of your Windows software, not just with Access, to create PDF files. The only disadvantage, compared with Access 97 Snapshot Viewer, is the cost.

If you can't afford Acrobat and you're still using Access 2 or Access 95, one other possible alternative is to export the report to a rich-text file and have your recipients download the Word 97 Viewer from *www.microsoft.com/word/*. You'll have to experiment with this to see whether the end result will meet your requirements, because the conversion process appears to strip away graphics and some of the report formatting (try this with the Northwind Catalog report to see what I mean). Therefore, this solution is best suited to simple reports that will survive the export process intact.

If you're still using Access 2 or Access 95, I strongly urge you to upgrade to Access 97. It's far superior and much more stable. There is also a rich set of third-party add-ons available—not to mention the availability of Access 97 Snapshot Viewer for distributing reports.—*Sal Ricciardi*

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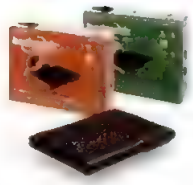

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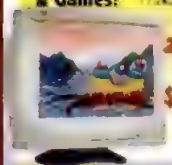

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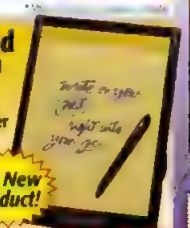

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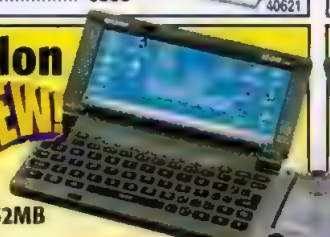

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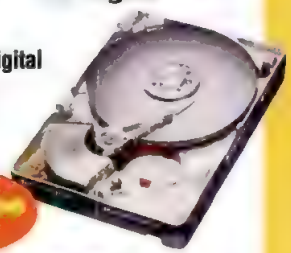

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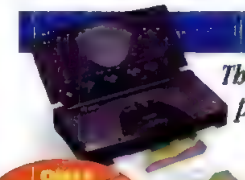

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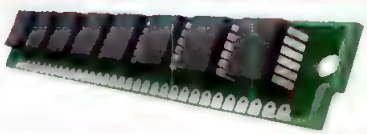

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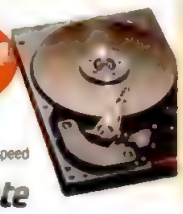

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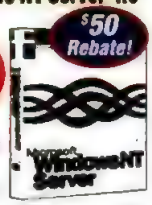

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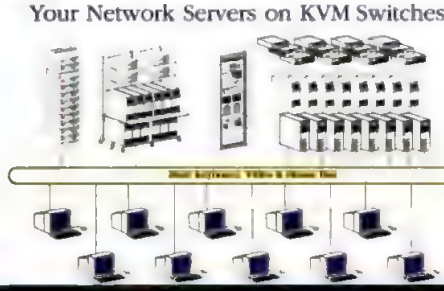

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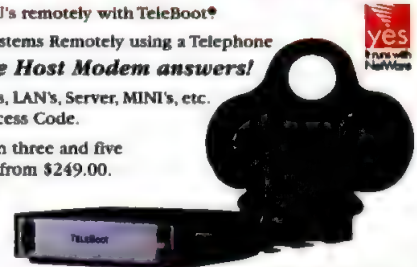

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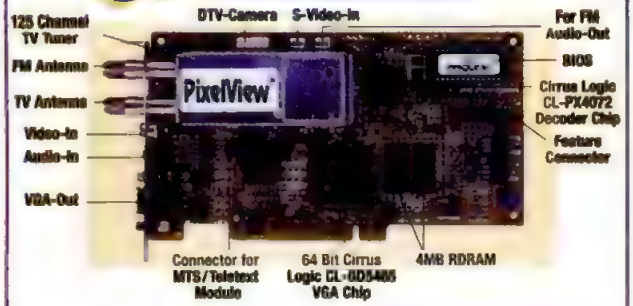

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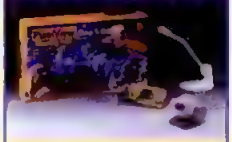

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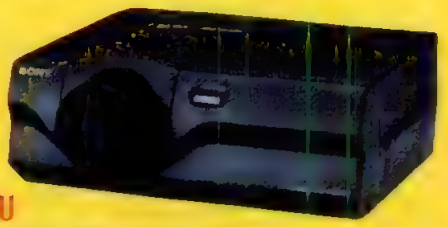

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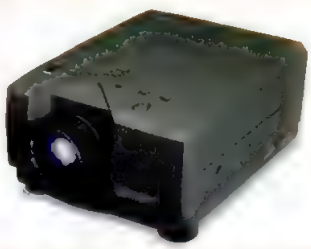

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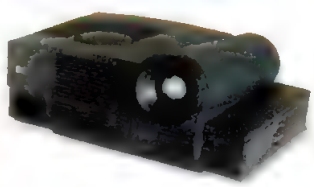

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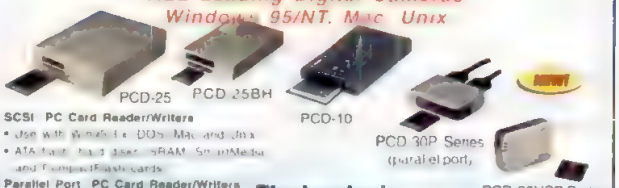

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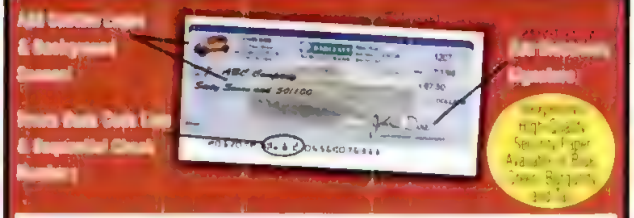

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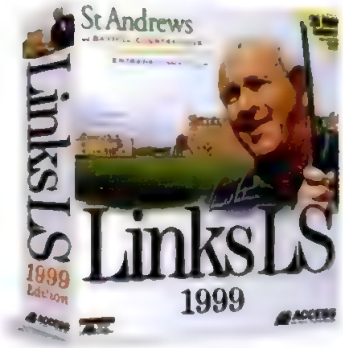

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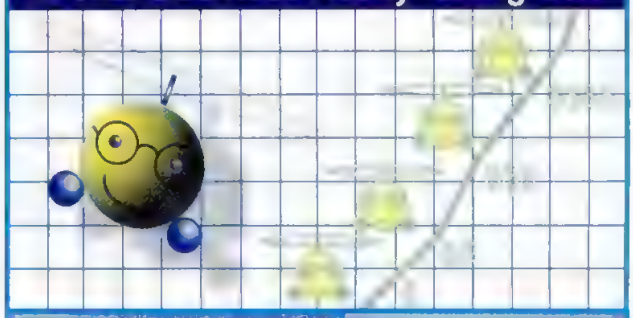

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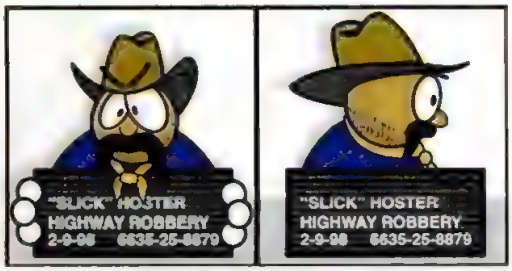

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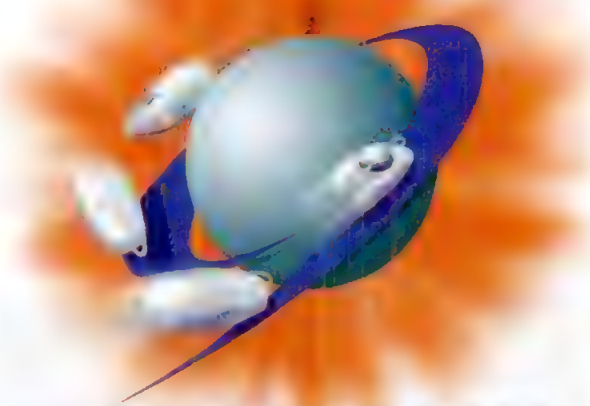

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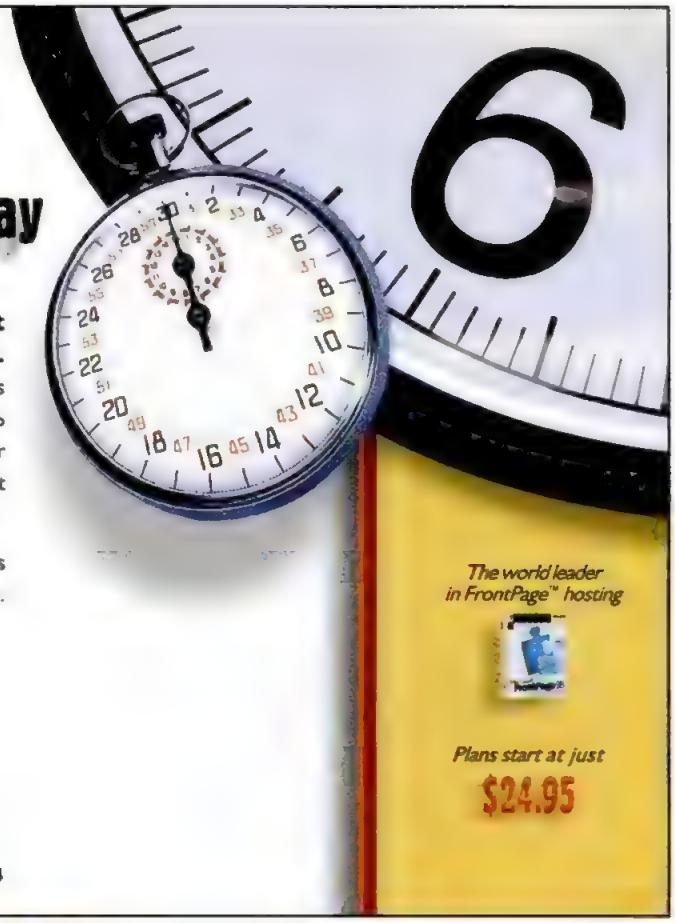

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256Meg	3.3V	300	750	600	834

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Pentium 300 MHz	350	Pentium 90/75	59/49
Pentium 266 MHz	250	486 DX4-100	45
Pentium 233 MHZ	175	DX2-66	25
Pro 200-512K	495	AMD	
Pro 200	295	K6-300 3D/266	179/149
Pro 180 256K	175	K6-266 3D/200	139/109
Pentium 233 MMX	129	K6-233/200	89/69

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8 x 32 32 MB	45	45	–
16 x 32 64 MB	149	–	–
1 x 32 4 MB EDO	9	9	–
2 x 32 8 MB EDO	13	13	–
4 x 32 16 MB EDO	22	22	–
8 x 32 32 MB EDO	44	–	–
16x32 64 MB EDO	129	–	–
1 x 36 4 MB	12	12	12
2 x 36 8 MB	23	23	23
4 x 36 16 MB	35	35	–
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Deskpro 8000 rSDRAM ECC)	16/32/64/128Meg	59/89/169/299
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Presario 4112 4122, 4160, 4402 (EDO pairs)	4/8/16/32Meg	12/18/34/59
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Presario 4704 4705 4710 4712 4714 4716 (EDO pairs)	4/8/16/32Meg	14/23/39/79
Presario 4764 4770 4784 4786 (SDRAM)	16/32Meg	34/69
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Presario 7170 7186 9536 9546 9548, 9564 (pairs)	4/8/16/32Meg	12/18/34/59
Presario 9232 9234 9240 9250 9642 9660 (pairs)	4/8/16/32Meg	12/18/34/59
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MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY Month(s) on
Armada 1100 1120T 1120 1125	8/16/32/64Meg	29/49/89/179	
Armada 1130 1130T (EDO)	8/16/32/64Meg	29/49/89/179	
Armada 1510DM 1520DM 1550DMT	16/32/64Meg	49/79/159	
Armada 4100 4105 D, 4120 T 4130T (pairs)	8/16/32/64Meg	39/49/99/199 ea	
Armada 7710MT 7730MT 7750DMT	16/32/64Meg	49/89/159	
Concerto 4/25, 433	4/8/16Meg	9/19/79	
Contura 4/25, 4/25C, 4/25CX	4/8/16Meg	39/59/79	
Contura 400C 400CX, 410C, 410CX	4/8/16Meg	39/59/79	
Contura 420C 420CX, 430C, 430CX	4/8/16/24Meg	39/59/79/99	
Contura Aero	4/8/16Meg	44/49/89	
LTE 5000 5100, 5200, 5300	16/32/64Meg KB	59/99/199	
LTE Elite 440C, CX, 475CX	4/8/16/24Meg	39/59/79/99	
LTE Lite 425	4/8/16Meg	39/59/79	
Presario 1512 1520 1525 1575 1596	8/16/32Meg	29/49/95	
Presario 1521 1531 1610 615 1625,1635	16/32/64Meg	44/89/179	

IBM NOTEBOOK/LAPTOP MEMORY

MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY Month(s) on
Thinkpad 310E ED 315	16/32Meg	49/79	
Thinkpad 340 345 355 360 C CE	4/8/16Meg	49/59/79	
Thinkpad 365C CS CD E ED	4/16Meg	39/59	
Thinkpad 365X 365XD	8/16/32Meg	29-44/89	
Thinkpad 380 380D 385D	8/16/32/64Meg	29/44/89/159	
Thinkpad 500 510CS	4/8/16Meg	49/59/89	
Thinkpad 560 560E 560X	8/16/32/64Meg	29/44/89/159	
Thinkpad 700 720 750 CL/755X	4/8/16/32Meg	49/89/109/169	
Thinkpad 701 701C 701CS	4/8/16/32Meg	19/29/59/119	
Thinkpad 755C CE CD CS CSV CSE DV	4/8/16/32Meg	49/89/109/169	
Thinkpad 760C CD L LD	8/16/32Meg	34/59/119	
Thinkpad 760E ED EL ELD	8/16/32/64Meg	34/44/89	
Thinkpad 760XD 760XL	8/16/32/64Meg	29/44/89/159	
Thinkpad 765D 765L	8/16/32/64Meg	29/44/89/159	
Thinkpad 770 (SDRAM)	16/32/64Meg	44/89/149	

TOSHIBA LAPTOP MEMORY

MODEL	AMT. UPGRADED	MEMORY PRICE	BATTERY Month(s) on
Libretto 50CT 70CT	8/16Meg	39/69	
Tecra 500CDT CS 510CDS, CDT	8/16/32/48/128Meg	29/49/89/129/249	
Tecra 520CDT 530CDT	8/16/32/48/128Meg	29/49/89/129/249	
Tecra 700CS, 700CT /SDRAM)	8/16/32Meg	59/69/149	
Tecra 710CT 720CDT 730CDT	8/16/32/64/128Meg	39/59/89/159/299	
Tecra 750CDT CDM,DVD	8/16/32/48Meg	39/59/89/159	
Tecra 730XCDT 740CDT	8/16/32/64/128Meg	39/59/89/159/299	
T2100 Series	4/8/16/24 Meg	9/29/59/79	
T1900 1905 1910 1400 1405 1410 Models	4/8/16/32Meg	39/49/79/119	
T2400 T3400 T3400CT T3600CT	4/8/16Meg	19/29/59	
Satellite 710CS 1955CS 1115CS 1170CT 1115CS	8/16/32Meg	39/59/89	
Satellite 2000CS 2060CS Series	8/16/32Meg	39/59/89	
Satellite 2200CS 225 305CDS 315	8/16/32/48/128Meg	29/49/79/129/299	
Satellite 7400 Series, T8000 Series	8/16/32Meg	39/59/89	
Satellite Pro 440 445 460	8/16/32/48/128Meg	34/49/99/159/349	
Portege 610CT 620CT	8/16/32Meg	39/59/89	
Portege 650CT 660CT	8/16/32/64/128Meg	29/49/79/159/299	

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Dimension XPS M166S M200 P133s 166s 200s, P133s 166v 200v	16/32Meg	39/59
Dimension XPS P90 P75 P90 P133 pairs	4/8/16/32Meg	11/16/29/59
Dimension XPS P90 P75 P90 P133	4/8/16/32Meg	11/16/29/59
XPS P90 P75 pairs, P75 P90 P133		
Dimension XPS P90 P75 P90 P133 pairs	4/8/16/32Meg	11/16/29/59
Dimension XPS P90 P75 P90 P133	4/8/16/32Meg	11/16/29/59
Dimension XPS P90 P75 P90 P133 ECC	16/32/64/128Meg	59/89/149/299
Optiplex GXM SDRAM	32/64/128Meg	89/149/299
Optiplex GXM SIMM Equipment	4/8/16/32Meg	19/29/59/79
Optiplex GXM SIMM Equipment	4/8/16/32Meg	11/16/29/59
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ACERNote Light 350, 352, 355	4/8/16Meg	19/29/54	
ACERNote Light 356, 358, 358, 361 (pairs) edo	4/8/16Meg	21/34/54 ea	
ACERNote Nuovo 671, 672, 372, 373, 374	8/16/32Meg	32/44/99	
ACERNote Pro 950, 954, 955, 957, 959 (pairs)	4/8/16Meg	21/34/54 ea	
AST Ascentia A41 A42	8/16/32Meg	29/44/89/179	
AST Ascentia P30 P50	8/16/32Meg	54/69/129	
AST Ascentia J10 J30,J50 (pairs)	4/8/16/20Meg	22/34/59/89 ea	
AST Ascentia 800N, 810N, 900N, 910N	4/8/16Meg	39/49/79	
AST Ascentia 950N	8/16Meg	54/79	
AT&T Globalyst 130	4/8/16Meg	19/29/54	
AT&T Globalyst 200 250, 250P	4/8/16/20Meg	44/49/79/129	
Austin DX4 DX2, SX2, SX Series	4/16Meg	89/169	
Canon Innova Book 350CD 380, 475	8/16Meg	29/54	
Canon Innova Book 48C 490 EDO (pairs)	8/16Meg	29/54 ea	
CTX EZ Book 500 600 Series	4/8/16Meg	22/29/54	
CTX EZ Book 700 Pent. Series (EDO) (pairs)	8/16/32Meg	29/54/119 ea	
CTX EZ Book 780MT, 765MT (EDO) (pairs)	8/16/32Meg	29/54/119 ea	
DEC HiNote	4/8/16Meg	29/39/69	
DEC HiNote Ultra, Ultra II	4/8/16/32Meg	22/29/54/119	
DEC HiNote Ultra 2000	16/32/64Meg	44/89/189	
DEC HiNote VP 120,525,535,545/150MMX (pairs)	4/8/16Meg	22/29/54 ea	
DEC HiNote VP 5100 5120	8/16/32/64Meg	29/49/99/199	
DEC HiNote VP CSS, LSS, CTS, LTS	8/16/32/64Meg	29/49/99/189	
DEC HiNote VP700	16/32/64Meg	59/119/219	
Dell Inspiron 3000	16/32/64Meg	44/89/199	
Dell Latitude CP M233XT	16/32/64Meg	59/119/219	
Dell Latitude LM, LM P166MMX (pairs)	4/8/16/32Meg	22/29/54/119 ea	
Dell Latitude XPi, CD, CX	4/16Meg	49/89	
Dell Latitude XM	4/8/16Meg	49/59/89	
Dell Latitude XP XPi XPi CD MH86ST	4/8/16/32Meg	22/29/54/129	
Epson ActionNote 650 650c 660c, 680cx	4/8/16Meg	19/49/79	
Epson ActionNote 880 886c, 890 910	4/8/16/20Meg	19/34/64/136	
Epson ActionNote 4LO/25 4LO/33 4SLi/2/2-50, 4080	6Meg	69 00	
Fujitsu Lifebook 400, 500 600 Series	16/32/64Meg	44/89/189	
Fujitsu Lifebook 500, 600 700 Series	16/32/64Meg	44/89/189	
Fujitsu Monte Carlo Montego, Milan	8/16/32Meg	29/44/89	
Gateway 2000 Colorbook 4/33	8/16Meg	89/179	
Gateway 2000 Solo Series (pairs)	4/8/16Meg	22/32/54 ea	
Gateway Solo Series 2100 2200 edo	8/16/32Meg	53/79/179	
Gateway Solo 9000, 9100, 2300	16/32/64Meg	44/89/189	
Hitachi C Series	8/16/32Meg	29/44/89	
Hitachi E-Series, MMX Series	8/16/32Meg	49/89/129	
Hitachi M-Series	8/16/32Meg	49/69/129	
Hitachi Visionbook Elite, Plus, Pro	8/16/32/64Meg	29/44/89/179	
HP Omnibook 800	8/16/32/64Meg	49/89/119/189	
HP Omnibook 4000C, CT C	4/8/16Meg	39/54/74	
HP Omnibook 5000CT, CTS C, 5500CS, 5700	8/16/32/64Meg	49/89/119/239	
Micron Millenia Transport Pentium (pairs) MRX	8/16Meg	29/44 ea	
Micron Millenia Transport VLX P133 (pairs)	4/8/16Meg	22/34/49 ea	
Micron Millenia Transport XKE P166MMX	16/32/64Meg	44/89/189	
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Midwest Micro Elite or Soundbook CD	4/8/16Meg	22/32/54	
NEC Ultralite Versa, E, V MP	4/8/16/32Meg	9/29/69/129	
NEC Versa S Versa 2000C, D 2285C	4/8/16Meg	22/34/54	
NEC Versa 2400 Series 2530 2535 (pairs)	8/16/20Meg	32/54/129 ea	
NEC Versa 2600 Series (pairs)	4/8/16/32Meg	22/34/59/149 ea	
NEC Versa 4000 4050/4080 4200, 4230	4/8/16/20/32Meg	44/54/89/129/129	
NEC Versa 6000 6050, 6030	8/16/32/64Meg	54/69/119/189	
NEC Versa 8200MDX edo	8/16/32/64Meg	32/44/99/179	
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Panasonic [illegible] Series	4/8/16/32Meg	44/54/79/134	
Panasonic [illegible]	8/16/32/64Meg	32/44/99/189	
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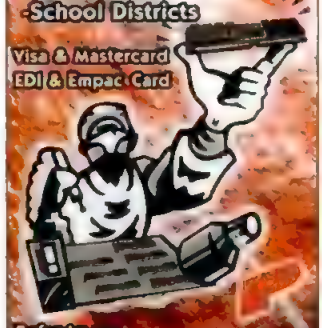

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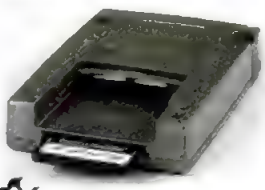

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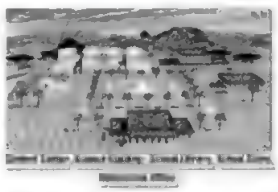
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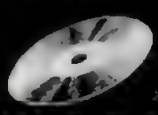
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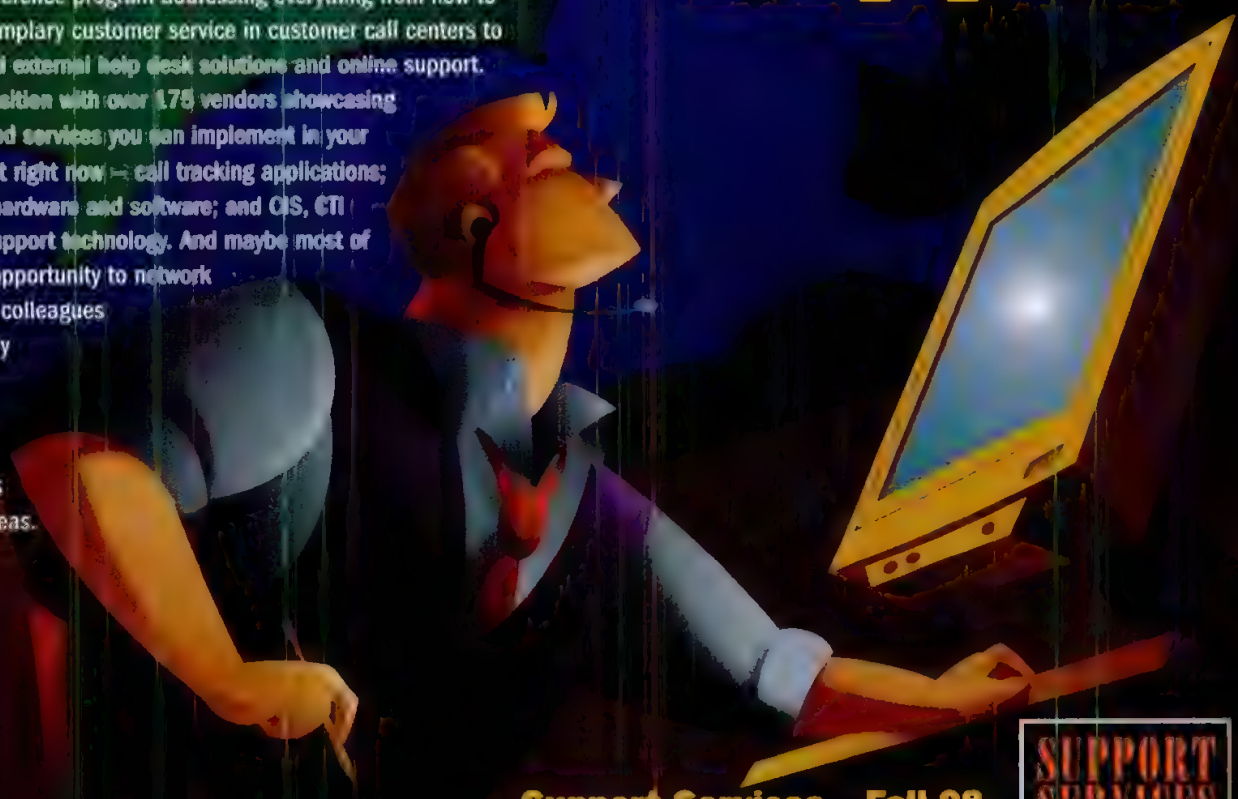

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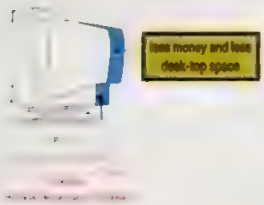

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By Julie Strasberg

Back to School time brings kids the promise of exciting new adventures as well as a chance to learn. The five programs reviewed here, from Broderbund, Creative Wonders, Disney Interactive, Edmark, and Knowledge Adventure, offer up a classic combination of fun and skill building. Younger kids can work on the fundamentals of math, science, and reading, while older ones can improve their vocabulary, boost their comprehension, and increase their logical reasoning power. Built on the premise that kids come back when they're having fun, these five programs are designed to help them enjoy the learning process.

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Unlike Reading Blaster, whose main focus is reading comprehension, Word Detective concentrates on developing word skills. Kids engage in five activities, solve the puzzles, and free the special agents. Code Breaker is a Boggle-like word-find challenge, and Micropix helps kids put words into their proper contexts. Fusion Chamber builds vocabulary by adding suffixes and prefixes to common root words; Power Pack is a clever strategic alphabetization game; and the ever-present spelling drill Spellanyzer, which appears more frequently than any other activity, reinforces spelling rules (as well as their weird exceptions).

Clearly, this program emphasizes education rather than fancy graphics, animations, or action. Although it transports kids to such exotic locales as Notalotenkammen's tomb in Egypt and Otto Readmore's Library in New York, the focus is on the educational activities within each setting. For help, an online 3,000-word dictionary provides spellings and definitions.

Word Detective comes with a highly detailed progress report that lets parents and teachers track the exact percentage of success for each activity (at all three difficulty levels), as well as the words children have spelled incorrectly. Kids can then work on them outside the program or incorporate them into the program's custom spelling list.

Though useful, ordinary spelling and grammar drills can be tedious; but Carmen Sandiego Word Detective puts these tasks into an engaging setting.

Madeline Thinking Games Deluxe

Young Madeline may be the smallest girl in Miss Clavel's school, but she's the feistiest. Madeline Thinking Games Deluxe could use some more of that little girl's spunk. The two–CD-ROM set consists of one disk with activities for kids aged 5 and up and a second disk with an interactive Madeline storybook.

The first disk seems to involve more pointing, clicking, and dragging than using brainpower. This CD includes 11 activities, which kids can begin playing by entering different parts of Madeline's house—from the kitchen to the classroom to the girls' famous 12-bed sleeping quarters.

Most of these tasks involve simple observation. In Pack a Picnic, for example, a child must

INSIDE

UNREAL ACTION
Simply amazing graphics fuel Epic MegaGames' latest shooting game. *Page 338.*

FROM THE MAYO CLINIC
Ultimate Medical Guide II provides trustworthy medical advice. *Page 338.*

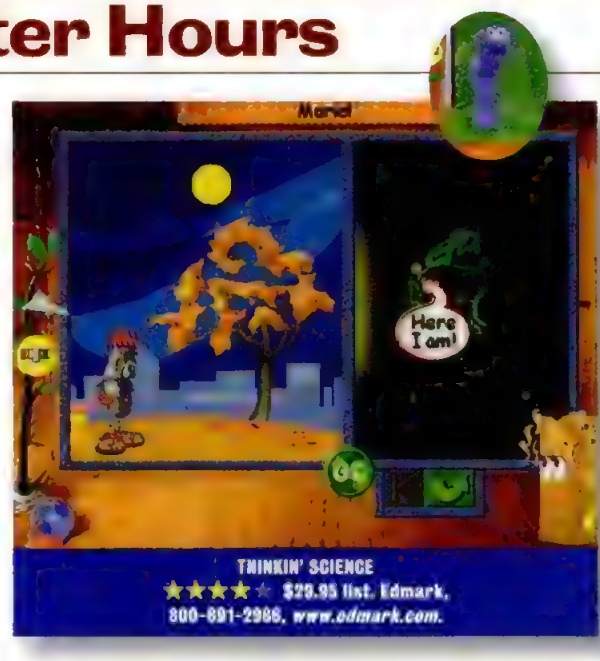
IT'S CRAFTY
Kids will get a kick out of creating their own projects with this new print program. *Page 340.*

load treats into a picnic basket as the treats move across a conveyor belt. At its most challenging level, the activity requires a child to select items that are next to specific objects: "Please get five souffles that are next to the cakes," Madeline instructs.

The second CD, a storybook, takes Madeline on a European journey. In classic adventure-game style, she must find some fine Swiss chocolate and a key to lower a drawbridge in Venice. Kids may hone their observation and problem-solving skills to get the items they need; they may even pick up *un peu de* French along the way.

Madeline Thinking Games Deluxe has a couple of minor technical glitches. Most notably, it needs to be run in 256-color mode to avoid performance slowdowns. Furthermore, the game is subject to long pauses in the middle of sentences. Neither problem is earth-shattering, and the game is otherwise sound.

Although kids may not learn a tremendous amount from Miss Clavel's most famous pupil, they will still have fun with her. Fun, after all, has always been Madeline's raison d'être.



Thinkin' Science

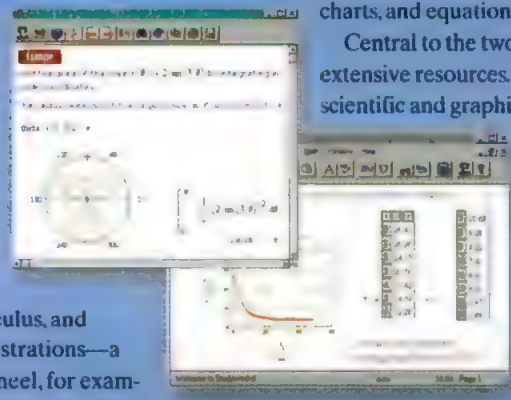
What gets kids interested in science? Is it facts and figures or the thrill of experimentation? Dry scientific terms or the possibility of learning by doing? Edmark's Thinkin' Science gives first- and second-graders the chance to use their powers of deduction, observation, and memory as they make their way through five activities and learn how to think like scientists.

Observation games, like What Do You See, incorporate nature scenes. Kids must memorize the positioning of animals in a scene, then replace them after a gust of wind blows them to the corner of the screen.

In Mystery Cave, kids deduce what item is hidden in the cave based on clues about its texture, smell, shape, color, size, and weight. Choices may be vastly different—say, a soc-

StudyWorks: The Ideal High-School Tutor

As evidenced on overflowing store shelves and back-to-school product roundups, there is no shortage of titles in the edutainment arena. But when it comes to the older kids—those in high school and college—there is a noticeable dearth of worthwhile material. StudyWorks Mathematics and StudyWorks Science (each $35 street) are definite highlights in their field, providing solid skill-building techniques with well-thought-out explanations and demonstrations.



As this is the second generation of the StudyWorks series, the producer—MathSoft (617-577-1017, *www.mathsoft.com*)—has included hundreds of additional practice problems, new glossaries, and increased content. But the foundation of learning through interaction and observation has remained the same.

StudyWorks Mathematics covers seven math disciplines on one CD-ROM: algebra I and II, geometry, trigonometry, precalculus, calculus, and statistics. Within each area are animated demonstrations—a sinusoidal function is illustrated with a Ferris wheel, for example—to make sure the student grasps the concept. Next comes a step-by-step explanation of how to solve the problem, be it a polynomial equation, ratio, or derivative. Finally, hundreds of practice equations and exercises let kids work through a skill until it's mastered.

As far as science—earth science, biology, chemistry, physics, and statistics—StudyWorks Science has the field covered. Using the same teaching method as in StudyWorks Mathematics, this CD-ROM introduces a problem, explains the steps of solving it, and then offers numerous exercises. Beginning with the basic concepts of earth science, such as weather, climate, or the solar system, and working through such advanced topics as the physics of light and sound, the science disk thoroughly dissects the subject matter. The program can also generate top-notch lab reports, showing graphs, charts, and equations.

Central to the two StudyWorks programs are their extensive resources. Each includes an on-screen scientific and graphing calculator, Princeton Review SAT II tips, reference tables, unit conversions, and a library of hundreds of related hyperlinked facts, equations, and explanations. And what resource center would be complete without an Internet link? A click of the mouse takes students to any of three areas on the Net: the Web Link, which features math- and science-related puzzles and games; Cyber Library, a continually updated supplement to the StudyWorks library; or the Collaboratory, a collection of math and science forums and study groups.

MathSoft offers a $30 rebate if you purchase both programs—and simple math will tell you that it's a deal too good to pass up.

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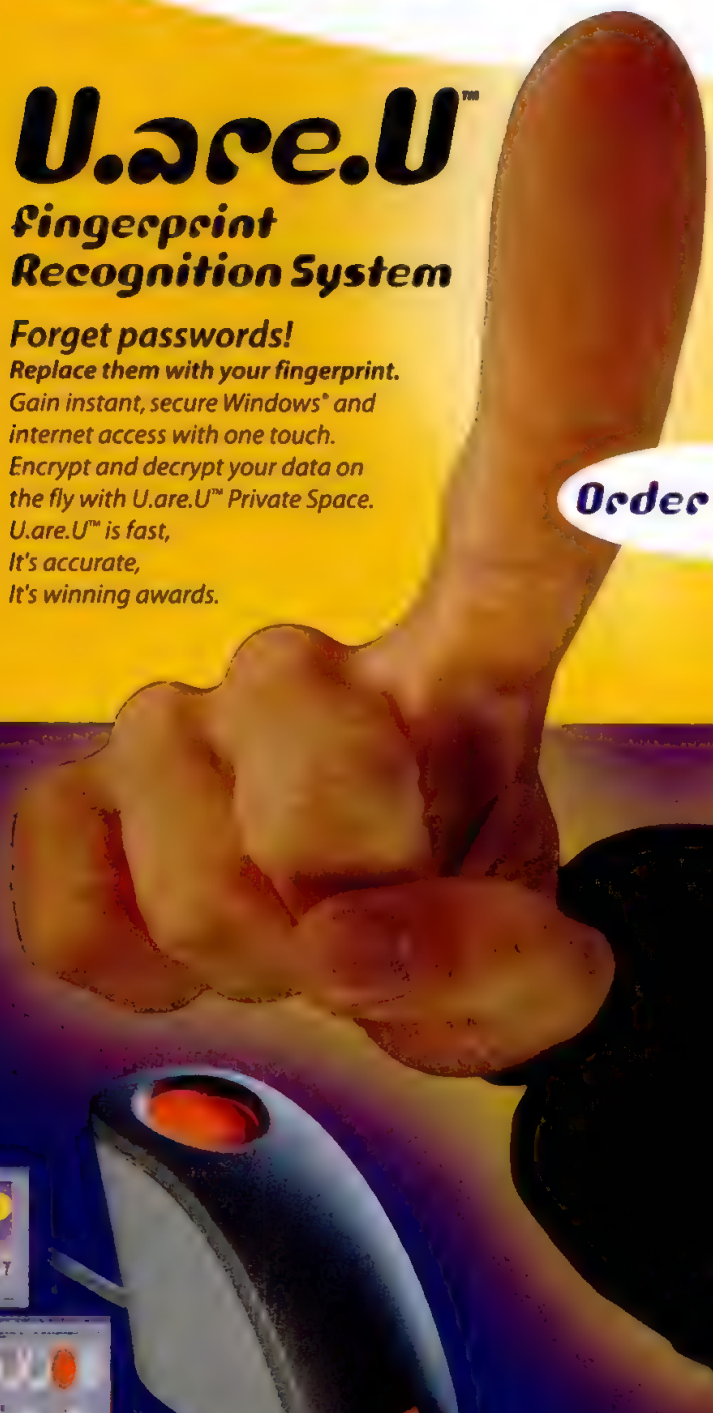

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PCWEEK BEST OF COMDEX
EDITOR'S CHOICE

cer ball, a mouse, a pear, and a shoe. Clues include statements like "The object smells like leather" and "The object's color is black and white."

Thinkin' Science is at its best when explaining abstract concepts, such as gravity and the earth's rotation. Fun Physics lets kids experiment with different concepts of motion using ramps, catapults, and bouncing balls. Meanwhile, Day and Night uses a split screen to relate the earth's rotation to the daily travels of the sun. As kids turn the earth on the right side of the screen, the left side shows the sun rising, setting, and then disappearing into the night sky as stars appear.

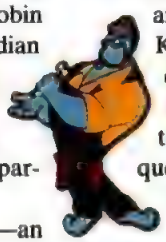
Four everyday objects serve as scouts who keep the activities fun and friendly and guide kids through each challenge. As kids progress through some 18 levels, their pals reward them with printable treasures. But the real reward of Thinkin' Science is the confidence and thinking skills a child can gain while playing.

Math Quest with Aladdin

With Math Quest, Disney Interactive has created an educational game that both kids and their parents can love. Kids in first through third grades will find 18 challenging activities interwoven into an exciting adventure. And with Robin Williams and the comedian Gilbert Gottfried reprising their movie roles as the Genie and Iago the parrot, Aladdin is likely to make parents laugh out loud, too.

MATH QUEST WITH ALADDIN
★★★★★ $35 list. Disney Interactive, 800-900-8234, www.disneyinteractive.com.

In this story, Bizarrah—an evil genie—has escaped from her lamp and captured the Genie, Iago, Jasmine, Aladdin, and Abu the monkey. Kids have to free each character by solving math problems and then continue the quest to find the lamp itself. The 18 activities reinforce different skills: addition, subtraction, sorting, geometry, problem solving, logical reasoning, and pattern identification.



Some puzzles, such as Missing Numbers, are simple counting exercises. Others, such as Geonim, require careful thought (especially at the fourth and highest difficulty level). In this game, children compete against the Magic Carnival Barker to place the last geometric piece on a patterned game board. The game's artificial intelligence gets better as the difficulty levels increase; that is, the Barker makes fewer obvious errors.

Kids can also enter Aladdin's Rec Room ("That's *rec* as in *recreation*, not like 'Let's wreck the place,' " notes the Genie.) There, they can play

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six games to earn points and be awarded a Mango Certificate. ("Did somebody say *mango*?! I LOVE mangoes!" shrieks the ever-hungry Iago.)

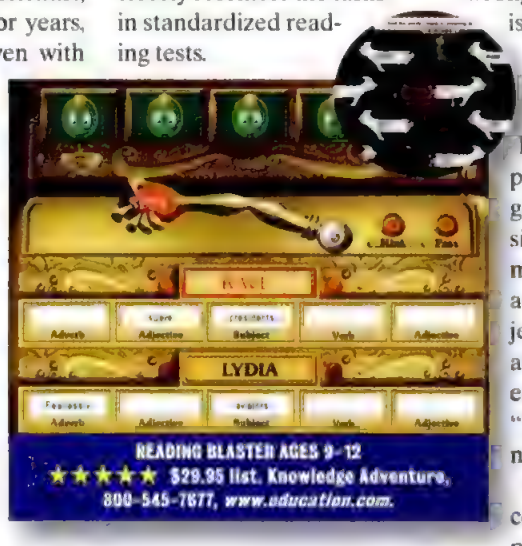
You'll find that Math Quest has one or two minor technical quirks. You must set the display at 256 colors, and occasionally the frame rate fails to keep up with the sound track. The program is otherwise flawless.

Skilled youngsters should be able to get through the story in about 3 hours. But like a Disney video, this game bears visiting again and again.

Reading Blaster Ages 9–12

Combine a good, silly story with serious language-building puzzles and you have a classic reading-education tool. Knowledge Adventure's Reading Blaster series may seem a bit long in the tooth, but it remains a leader in the field. (Note that other versions of this long-running series are for younger kids.)

The plot unfolds: Dr. Dabble, Bizarroville's mad scientist, is bent on revenge. For years, he's waited to get even with six of the town's most famous residents—Gloria Ghastly, Coach Gulliver Lilliput, Mayor Jackie O'Cassidy, Gorky Barf, and Lou Fright and his wife Bobbi "Sox" Fright. After inviting them to a party at the mansion, he makes each one disappear. It's the job of the hero, Rave, to gather evidence to help find all six.



To uncover the clues, Rave must master six word activities that help kids in areas such as synonyms and antonyms, definitions, sequencing, finding the main idea, reading for detail, and parts of speech and grammar. Many of these activities closely resemble the tasks in standardized reading tests.

That similarity doesn't make the activities boring or intimidating, though. To find synonyms and antonyms in the game called Catacombs, for example, Rave must hop onto ghosts who fly through the air with words on their backs. One wrong hop and the ghost vanishes while Rave plummets out of view.

Sentence Spinner, an activity that helps kids learn the parts of speech, pits Rave against Lydia the ghost in a race to construct silly sentences from grammatical terms generated by a one-armed bandit. "Subject, verb, preposition, adjective, direct object," for example, may become "Tortoises venture amid naughty cougars."

Each time Rave succeeds at an activity, a piece of evidence appears. There's plenty to read in Reading Blaster and even more to do. Most of all, it's a blast for kids to play.

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PC WORLD — August 1998

The Next Big Thing

This action game shouldn't be compared with Quake: It's in a category by itself.

Epic MegaGames' Unreal was in development for nearly four years—and the effort shows. Thanks to a staggering 3-D graphics engine and excellent single-player game play, Unreal is nothing if not impressive.

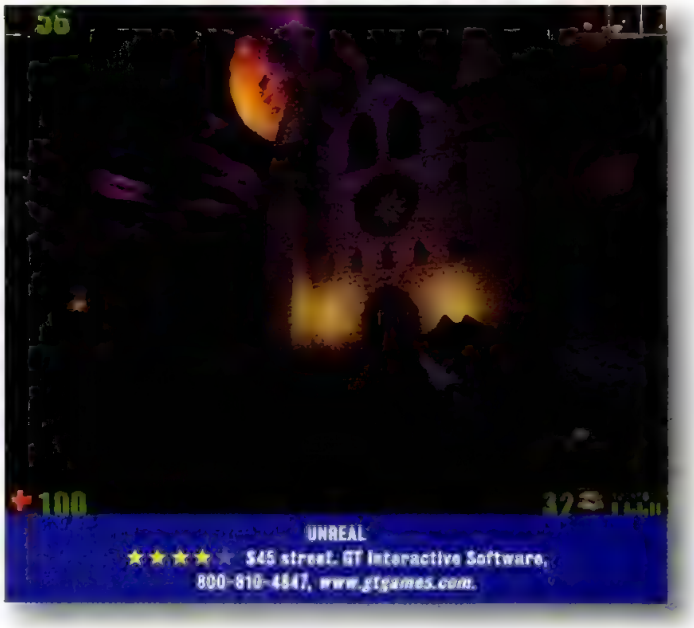
We must point out that Unreal (which is published by GT Interactive) requires some hardcore hardware to run at its best. According to the box, the game requires a Pentium/166 with 16MB of RAM, but that's simply not realistic. You will want at least a Pentium MMX/233 with 32MB of RAM and a 3Dfx-based 3-D graphics accelerator, though even on that machine the game will be slower than you might prefer. For ideal performance, you'll want a Pentium II with 64MB of RAM and a 3Dfx Voodoo2 card.

Is this game worth the hardware investment? We think so. Simply put, Unreal is the best-looking game we've *ever* seen.

You start the game aboard a prison ship that has crash-landed on an alien world. A reptilian race known as the Skaarj has subjugated this planet and its native people, the timid Nali. As you try to escape this planet and eliminate the Skaarj oppression, you move through a variety of lush settings, including a slew of vast outdoor vistas, a Nali village in the sky, and a suitably alien Skaarj spacecraft.

Unlike the enemies in Quake 2, those in Unreal typically attack alone or in small groups. Also, there are vast stretches of the game where you simply explore without seeing a single monster. We liked this feature, but some action fans might find the pace a bit disappointing.

The real disappointment, though, lies in the multiplayer support. Though the game supports up to 16 players over TCP/IP links, performance is typically too slow for the game to be playable. Despite our fiddling with the game's many performance settings, we only rarely found a game that moved at a reasonable pace. As we went to press, Epic was working on a patch to address the performance issues.



Still, there's no denying Unreal's obvious merit. The graphics engine is unparalleled, and the single-player game is fantastic. Hopefully, the multiplayer issues will soon be resolved.—*Michael E. Ryan*

The Doctor Is In

Ultimate Medical Guide II provides sound advice for a reasonable fee.

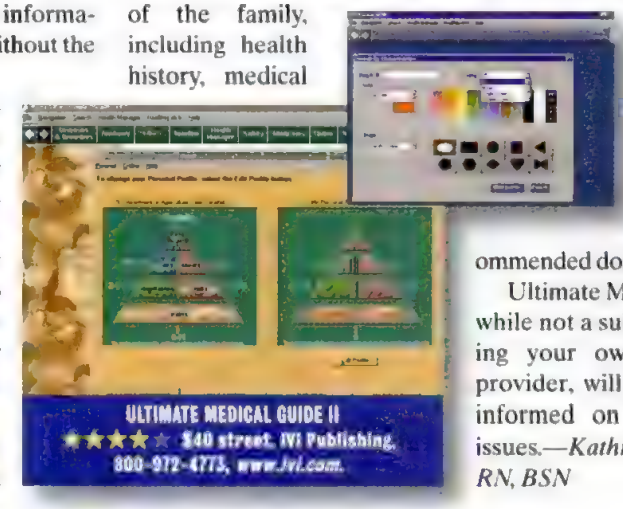
How many times have you come home from the doctor's office only to realize you forgot to ask all the questions you had in mind? Ultimate Medical Guide II, consisting of Mayo Clinic Family Health and Mayo Clinic Family Pharmacist, offers information you can trust—without the medical jargon.

Mayo Clinic Family Health 4.0 has three components: Family Health, Health Manager, and Food Pyramid. With an Internet connection, you'll also have access to the Mayo Health site for up-to-date medical news.

The Family Health portion is an excellent medical reference, with easily understood facts about illnesses, common symptoms, anatomy, and first aid. Colorful 3-D illustrations and videos bring the facts to life. Health Manager allows you to set up a personal profile for each member of the family, including health history, medical immunizations, allergies, and medications. All medical contacts can be listed in the handy address book. The Food Pyramid section of the Family Health CD-ROM provides an opportunity to chart your food intake and is a simple way to see if you're eating a balanced diet.

The second component of the Guide, Mayo Clinic Family Pharmacist, lists thousands of brand-name, generic, and over-the-counter (OTC) medications. Besides standard what-the-drug-is-for info, it includes facts on possible drug interactions, side effects, and recommended dosages.

Ultimate Medical Guide II, while not a substitute for seeing your own health care provider, will keep you well informed on family health issues.—*Kathryn F. Munro, RN, BSN*



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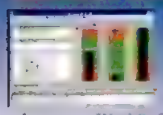

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Crafts for Kids

Here's a printing program designed for the younger crowd.

Greeting cards, board games, puppets, masks, stickers, stationery, banners—these are but a few of the projects kids can make with Print Artist Craft Factory.

Choosing among the 22 different types of projects on the Main Menu is a snap, even for a 5-year-old. (Craft Factory is targeted at those 5 and older.) The program is icon-driven, and throughout the program, icon meanings are identified by audible voice descriptions—great for those who haven't quite mastered reading. An on-screen keyboard helps teach the keyboard layout, and the audio dictates the letters, teaching very young children the letters of the alphabet.

However, once a project is chosen, the intuitiveness rapidly declines. Editing a project is done from a pull-up menu that appears at the bottom of the screen, and the selections are difficult to see. Editing becomes more difficult if you want to stray from the sparse set of templates provided.

The company seems to have considered the imagination of children who would likely tire of canned examples anyway; it has provided a large variety of graphics that should maintain your child's interest. There's also scanner and digital camera support for importing personal photos. Once kids learn how to navigate the program, they'll find the tools—fonts, graphics, and special effects—to make some truly creative and innovative crafts.

The manual is quite good at clearing up interface questions and even provides step-by-step instructions for sample projects. While they are helpful, the instructions can be quite wordy and are therefore better suited for older children, say ages 11 and up.

Printing is a snap, and the program even offers an outline printing of the project, to be used as a "coloring book" picture.

Although the editing takes a bit of getting used to, the wealth of graphics and the number of projects are strong points of Craft Factory and will allow your child to grow with the program.—*Diane Jecker*

Coming Up

What's in the Next Issue of *PC Magazine*

Top 100 Most Influential Companies

Last year we started listing the top 100 companies according to their influence in the industry. We'll continue this popular approach for a second year. Be sure to check out who's moved up and who's moved down compared with last year's listing. And we've got a few other takes on different areas of the industry to fill out the picture.

New Chips Are Coming

No one ever said "a processor is a processor is a processor." For the second year running, *PC Magazine* reviews and compares the market's leading x86 CPUs—including the AMD K6-2, the Cyrix MII, and several versions of the Pentium II. Using the results of more than 100 ZD benchmark and applications tests, Michael Slater—executive editor of *Microprocessor Report*, the chip industry's leading trade publication—tells you which chips to buy now and what to expect from the near future.

Professional Graphics

The PC-based graphics market for professionals continues to offer more and more sophisticated packages: But the lines between product categories are blurring. We'll test and review high-end drawing and image-editing packages.

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PC Magazine, ISSN 0888-8507, is published twice a month except in July and August at $49.97 for one year. Ziff-Davis Inc., One Park Ave., New York, NY 10016-5802. Periodicals postage paid at New York, NY 10016-5802 and at additional mailing offices. POSTMASTER: Address changes to *PC Magazine*, PO Box 54093, Boulder, CO 80328-4093. The Canadian GST registration number is 14049 6720 RT. Canada Post International Publications Mail Product (Canadian Distribution) Sales Agreement No. 266477. Printed in the U.S.A.

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I then decided to purchase a genealogy program, and chose Family Tree Maker because of the FamilyFinder™ Index. I went home, loaded the program, did a search in the FamilyFinder Index using my great-great grandfather's name, and it referenced a World Family Tree™ CD*. I couldn't believe my eyes!

I found the name "William Hunt Wilson" on the CD. The family tree was huge — hundreds of names! My name was not there, so I decided to contact the tree's contributor to let her know that I found the connection. I left a message, and that night, I received the long-awaited call. The contributor, who is also my cousin, was screaming on the phone because she could not believe she had found me. **I was part of a "long lost leg" that the family had not heard of for over 50 years!** We laughed, we cried, and talked all night. And now, we have contact every day — either by phone or by email.

A family reunion is scheduled to take place this Fall, thanks to Family Tree Maker. I never would have found my family if it weren't for the program.

Thank you!

Diana Yasher
San Jose, CA

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- FamilyFinder Index tells you exactly where to find information on your family
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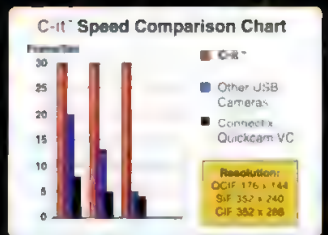

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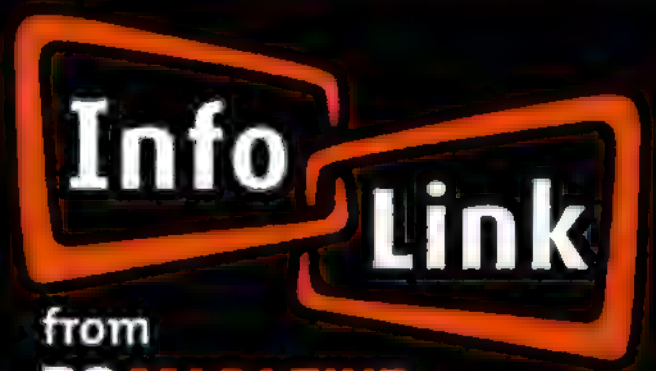

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Floppy Drive	1.44MB, inserts in Module Bay or connects via optional cable.	1.44MB, inserts in Module Bay. Connects with supplied cable.	**1.44MB, inserts in Module Bay or connects via optional cable.**
CD-ROM	24-max-speed CD-ROM.	20-max-speed CD-ROM.	**24-max-speed CD-ROM.**
Keyboard	Full-size, 87/88-key with embedded numeric keypad.	Full-size, 87/88-key with embedded numeric keypad.	**Full-size, 87/88-key with embedded numeric keypad.**
Size	12.9 x 10 x 1.4 inches.	12.8 x 9.49 x 1.74 inches.	**12.9 x 10 x 1.4 inches.**
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SOST-13G	Intel Pentium Mobile 266 MMX	64MB	3.2 GB UDMA	24X	13.3" Active Matrix	$79	$2,049.99
SOST-14A	Intel Pentium II 233 MMX	64MB	3.2 GB UDMA	24X	14.1" Active Matrix	$84	$2,199.99
SOST-14D	Intel Pentium II 266 MMX	64MB	3.2 GB UDMA	24X	14.1" Active Matrix	$91	$2,399.99
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1. **www.thefinger.com** is a

(**a**) pop-culture e-zine

(**b**) multilanguage dictionary of swear words

(**c**) porn site

2. **www.shroomy.com** is a

(**a**) weird inscrutable personal site

(**b**) site about mushrooms

(**c**) porn site

3. **www.drgolden.com** is a

(**a**) money management site

(**b**) site about plastic surgery

(**c**) porn site

4. **www.wetwetwet.co.uk** is a

(**a**) guide to hiking in Northern England

(**b**) tribute site to a British rock band

(**c**) porn site

5. **www.whitehouse.com** is a

(**a**) White House souvenir shop

(**b**) site to discuss the latest hot political issues

(**c**) porn site

6. **dailylung.com** is a

(**a**) newsletter on pulmonary health issues

(**b**) smokers' rights site

(**c**) porn site

7. **www.captivator.com** is a

(**a**) site that sells hat racks

(**b**) self-hypnosis training site

(**c**) porn site

8. **www.apeculture.com** is a

(**a**) funny e-zine about modern society

(**b**) site focusing on primate research

(**c**) porn site

9. **www.beef-cake.com** is a

(**a**) site devoted to "South Park"

(**b**) site devoted to male soap-opera stars

(**c**) porn site

10. **www.juicymango.com** is a

(**a**) vegetarian recipe collection

(**b**) travel site focusing on the Caribbean

(**c**) porn site

Answers: 1–a; 2–a; 3–b; 4–b; 5–c; 6–a; 7–a; 8–a; 9–a; 10–c.

If your entry is used, we'll send you $50 and a *PC Magazine* T-shirt. Send your entries to Abort, Retry, Fail?, *PC Magazine*, One Park Ave., New York, NY 10016-5802 or via e-mail (text items only) to *don_willmott@zd.com*.

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